INTERSTATE CITY

By

Erik Millward

A thesis

submitted to the Faculty of Graduate Studies

in partial fulfillment of the requirements for the Degree of

Master of Architecture

Department of Architecture
Faculty of Graduate Studies
University of Manitoba

Winnipeg, Manitoba, Canada

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

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Figure 1
Interstate Highway System
from Rand McNally Road Atlas 2000- Millennium Edition: map 3 (emphasis added).

0 PREFACE

Imagine a city that bustles with movement and desire. It is an almost endless place with no defining horizon, bounded only by the lateral constraints of its path and the logic of mobility. Think of a park, the grandest park, with a cornucopia of trees and flowers from everywhere, hills and valleys extending forever, all around you, but always out of reach; or the old city, twinkling beside you, the ramp down to it like a trip back in time. This is the backdrop to Interstate City. We easily move within it on neutral beds of asphalt. And so smooth! In sealed pods, everyone moves as a collective stream of mobile ideals following the written and intuitive codes of conduct in this engineered city. You can spend all day here, in this mobile world. Its scale is unlike anyplace else, unlike the historic urban centers or the quiet rural landscapes that pass beneath it. To leave it is to return to another world, a nostalgic world of decaying cities, romanticized ruins and the labor of pedestrian traffic. Thankfully, we don't have to worry about leaving very often because we have all we need right here. In our community we have entertainment, pleasure, art, culture and industry all under the democratic rule of our government. To ensure compliance and continuity, we are monitored at all times by invisible forces and frequencies. These digital forces are reshaping our mechanical city as we speak. In the end, they may redefine our spatial relationships to the old cities and landscapes from which we have tried so hard to separate ourselves. Whatever the results, Interstate City is sure to remain the urban capital of the United States of America.

The point is to drive. That way you learn more about this society than all academia could ever tell you... This creates a new experience of space, and, at the same time, a new experience of the whole social system.[1]

Jean Baudrillard, *America*

1 ABSTRACT

Interstate City explores a unique urban form that has developed its own character and culture beyond its infrastructural beginnings. This thesis seeks to explain the emergence, development and constitution of a complex form of infrastructure and human settlement. To help generate ideas and formulate a critical position, a site is chosen at random. The case study examines the local and regional implications of a national agenda to identify processes that have undergone significant 'shifts' in the way we use the road. It frames its position by examining five phenomenons that contribute to the shift from infrastructure to urbanism. Each 'shift' represents a significant point of departure in the relationship of the highway and the city. While thematically very different, together they help explain the subject. Ideas of speed, density, land use, permanence and introversion frame the investigation of Interstate City in its local, regional and national context. To conclude, this thesis speculates about the future of the highway and settlement around it.

In America, the architecture of the road has become the last vestige of clarity in 21st Century urbanism.[2]

N. L. Appel, *The City of the 21st Century*

CONTENTS

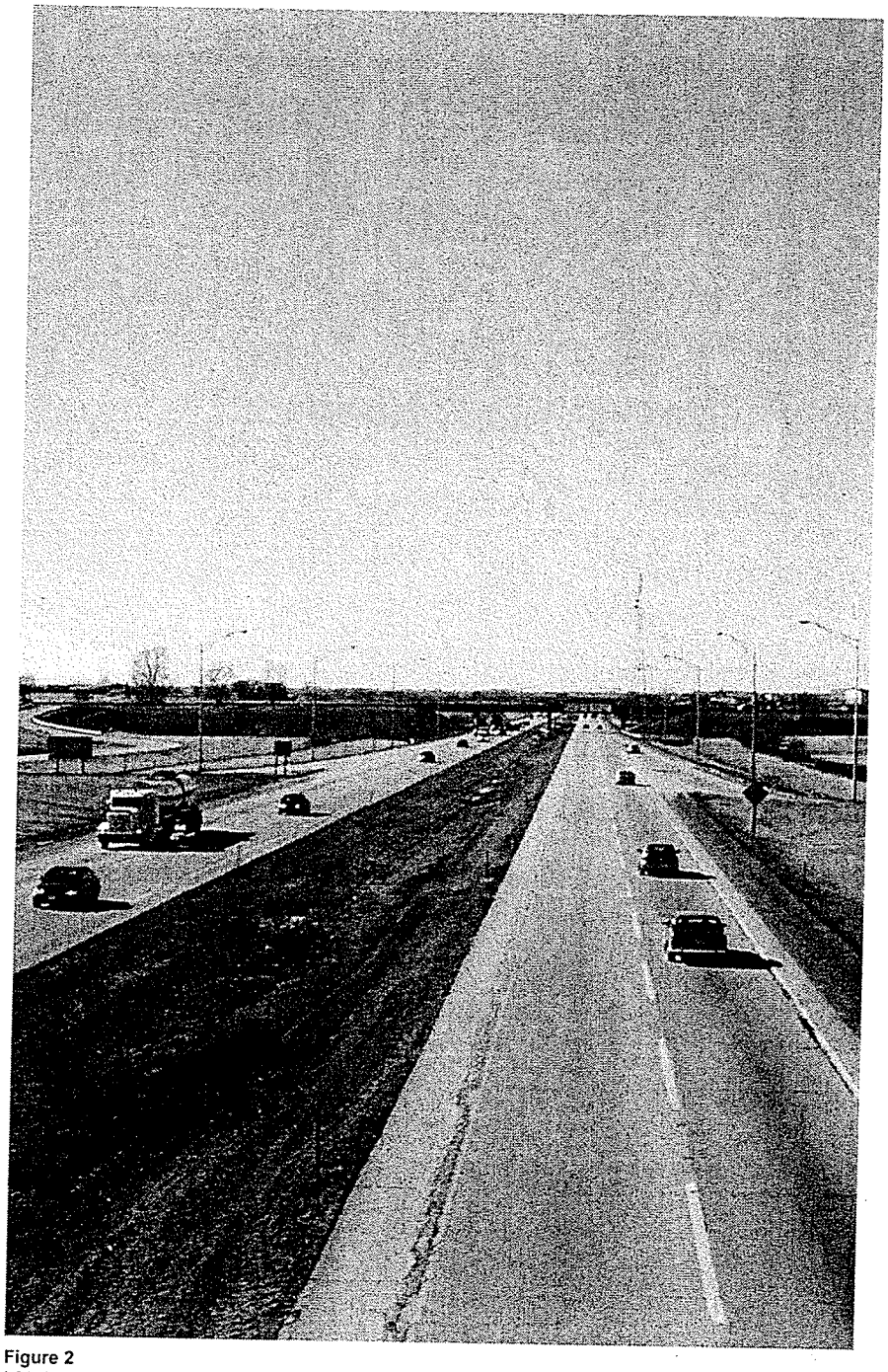


Figure 2
I-80: Interstate City

1

Interstate City

2 INTRODUCTION

The interstate highway is a city. We seamlessly inhabit it everyday whether we realize it or not. It organizes our lives, it lays out where and how we shop, it determines where we live and work, and dictates the social contracts within it. We intuitively navigate our way through it with ease, cruising from region to region. Interstate City does not subscribe to traditional notions of urban space and boundaries. What it may lack in subtlety it makes up in breadth, in its uncompromising and unwavering belief in itself as *the* built form of the 21st Century (Figure 2).

Interstate City responds to the circumstances of time and place. While historic settlements embedded themselves firmly in the soil, Interstate City reflects a different sensibility that is deeply engrained in the psyche of its citizens. As life and time continue to accelerate, the traditional city becomes obsolete. It is no longer the magnet for those seeking the freedom of choice, grandeur of form or optimism of the future. It has lost its symbolic power. The contemporary city must be reflective of the desires and ambitions of its citizens, one that accommodates a density of ideas, cultures, and beliefs. Interstate City has unwittingly become this new place, supplanting the historic settlements that have ceased to reflect the values of its citizens. It is a collage of energies acting and reacting together. You are either within it, or not. It separates and segregates but also connects and unifies. It is democratic and systematic, controversial, political, obtuse and sublime

As new and greater road-systems are added year by year, they are more splendidly built. I foresee that roads will soon be architecture too...great architecture.[3]

Frank Lloyd Wright, An Autobiography

3 BACKGROUND

Unlike the traditional city, the highway is criticized for its placelessness and environmental insensitivities. It is perceived as an element within the urban and rural tapestry of the country that has perpetuated the destruction and decline of the old city. In the 1950s entire neighborhoods (and ultimately cities) were leveled by a public policy that valued mobile commodity over urban continuity. The traditional city was seen as something that needed to be updated to the ideals of the day. Progress was measured in the newness of invention and this applied as much to urban planning as to automotive styling.

Originally, the highway was a democratic tool used to unite the country, both physically and symbolically. It allowed previously unreachable regions to be explored and exploited. It helped colonize the West and create the most powerful economy in the world. [4] The highway freed Americans from the constraints of geography. Today however, the highway has lost much of its original symbolism. It exemplifies the failings of American mid-century urban planning, though this view takes only part of the equation into account. Attempting to ratify the existence of the highway within the old city is difficult - the highway perceived as infrastructure alone tells only part of the story.

While urbanists and planners were looking at the highway as an object within the old city something interesting happened - the highway developed its own identity. Its spatial and programmatic detachment from the old city and landscape that is seen as its greatest failure is precisely what has made it successful. Spurred by the popularity of the automobile, it has created its own rules of conduct, culture, economy and architecture to define it. It has become the defining line of an endless city that has been unfurled across 42,000 miles of the American landscape.

4 OBJECT (WHY THE HIGHWAY)

As seen in Baudrillard's writings on Los Angeles and the desert, the highway is a "challenge to meaning and profundity, a challenge to nature and culture". [5] For nearly fifty years, the Interstate Highway System has pursued its ambitious automotive goals with little resistance from its many detractors. Although support at the federal level assured its execution, the story of the road and its urban accession reflects the collective values and the architectural vision of the American city in the 20th Century. As such, it warrants investigation.

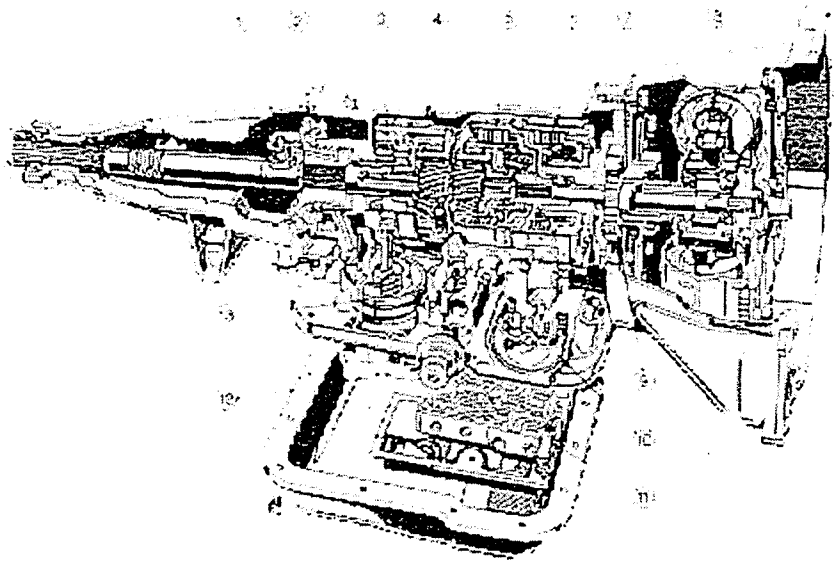


Figure 3
Cutaway: 1980 Ford Capri automatic Transmission
from Hayes Manual

5 SHIFT

Interstate City is everywhere. As a ubiquitous object, it presents a forum to explore architectural ideas that resist formal temptations to change with contemporary fashion.[6] While it appears as a solid, never changing object, the emergence of Interstate City can be explained as a result of significant shifts in the planning and construction of the modern highway and the subsequent culture and industry it has in turn generated.

The term 'shift', in an automotive context, describes the process of physically engaging the transmission. It requires a certain skill set to coordinate the release of the gas pedal, depression of the clutch and the change of gear but is a procedure that most American car owners perform naturally. In the past 50 years however, the method of changing gears has undergone a revolution of sorts. In 1940, barely 5% of all transmissions were automotive gearboxes compared to over 95% today. Manually shifting the clutch between gears has been designed out of the hands of the driver and become lost to history in the process of automation (Figure 3). The removal of the manual transmission, while considered an inevitability or simply the natural next step in automotive evolution, hints at a more profound change. But what caused this 'shift' to occur in the first place and what is the trickle down effect to the experience of the road? By altering just one aspect of our automotive responsibilities, the view from the road undergoes significant changes.

Interstate City is described by examining five significant shifts:

3.1 *Acceleration*

The spatial and programmatic constitutions of Interstate City are derived from the acceleration of movement and the foreshortening of time and distance. Building on Giedion's *Mechanization Takes Command*, Acceleration traces the effects of these cultural forces on the old city, the highway and their role in the creation of Interstate City.

3.2 Decentralization

Early in the 20th Century, as the industrialized city became increasingly congested, proposals for new urban settlements began to appear. Interstate City emerged decades later, in part from these decentralized plans. In chronicling the shift away from a centralized urban core, the spatial constitution of the present Interstate City comes into focus.

Figure 4
I-80/I-287 Interchange
from *2002 GlobeXplorer, AirPhotoUSA*: published on www.mapquest.com

3.3 Line

Interstate City is adaptable. The overarching line of the highway forms the backbone that structures the whole. It easily absorbs any event or program along its edges without disruption to the operation of the whole.

3.4 Erasure

Interstate City is a new city. It follows the internal logic of mobility at the expense of landscapes and existing cities. While traditional cities build upon the urban fabric of the past, Interstate City invents itself anew. It methodically lays its perfect surfaces across the country and establishes its own definition of regionalism.

3.5 Introversion

Automotive refinement, improved road building techniques, and the spatial boundaries of the highway have led to increased introversion in Interstate City. With introversion and increased speeds comes the loss of traditional public space. Instead, the public realm is played out 'at speed' between the interchanges amongst the sedans, wagons and SUVs, linked through evolving communication technologies that are revolutionizing the "view from the road."

Outlook

The expansion of digital infrastructures and a renewed contextual awareness promises to transform the great mechanical city. From this perspective, many of the shifts that help explain its emergence will be questioned as this final chapter speculates as to the future of Interstate City.

6 CASE STUDY

Context and scale are perhaps the most difficult elements of Interstate City to examine concisely. Its incredible breadth can overshadow the subtleties of the particular. The case study (Appendix A) is a way to generate and examine ideas ('shifts') that begin to formulate a critical position on the highway. Additionally, it helps to contextualize the ideas within the landscape. The I-80/I-287 interchange in Parsippany, New Jersey was chosen at random to explore the shift from highway to Interstate City. Located 30 miles west of Manhattan, the I-80/I-287 interchange is indicative of thousands of other places in Interstate City, somewhere between city and country (Figure 4).

7 TERMINOLOGY

The *Dwight D. Eisenhower Interstate and Defense Highway System* refers to over 42,000 miles of divided, limited access, high-speed roadways. The Interstate Highway conjures images of roadside stops, fast food drive thrus, office parks, and big box stores. It also invokes sensations of speed and open space. 'System' unjustly neutralizes the processes taking place on and around the highway. It seems that its complexity and richness is better described by using a much more emotive term like *city*. *Interstate City,* then, refers to these and other events unfolding because of (and in spite of) the presence of the highway.

Existing simultaneously on a local, regional and nation scale, Interstate City requires a rethinking of both infrastructure and urbanity. The idea of Interstate City broadly refers to the Interstate Highway System and the linear development around it. Interstate City is in fact a paradox. 'Interstate' implies a relationship between two or more states. 'City' on the other hand refers to a more contained recognizable place, one embedded in culture, geography and history. Interstate City is an a-scale place with no center that has emerged as a distinct urban form in the last half century. It is a self-contained form of human settlement rather than just a piece of infrastructure.

8 FOCUS

Interstate City looks at the growth of the highway on its own terms. Much has already been written on the failings of the modern highway, from its environmental insensitivities to the propagation of suburban sprawl. Many see the highway as the greatest problem facing the contemporary city but this is not the argument here. Interstate City celebrates the automobile city, born of the desires of its motorized inhabitants, and follows the story of the road from a simple dirt track to today's complex urban form.

Figure 5
Stuck in the mud

2

The Road Historic overview of the highway

9 EARLY INFRASTRUCTURE

The road has always played an important role in establishing patterns of human settlement. The story of early American infrastructure and settlement however, begins along its river system (Appendix A.4). The fortune of a city was dependent upon its ability to link itself with other markets. Cities in the east relied on the Hudson, Potomac, Missouri, Mississippi and the Delaware Rivers to build the foundation of the future union.[7] It was along these natural waterways that goods and personnel were shipped to further developing cities, thereby extending the prospects of the developing nation. The first great infrastructure project in North America, the construction of the Erie Canal, opened the American Midwest to trade and travel with the Eastern Seaboard. Immigrants and freight docked in New York Harbor before being released up the Hudson toward the Canal. Once through the locks, cargo navigated the Great Lakes and settled as far west as Chicago. Unfortunately, the river system limited access into the interior of the country. The incredible expanse of the country and the topographic variations presented many physical challenges in navigating the land and rivers. Settlers were faced with the prospects of an immense geography. In 1808, the most efficient way to ship goods from Pittsburgh to Philadelphia was by water: "Down the Monongahela River to the Ohio, then down the Mississippi to New Orleans, around the tip of Florida and up the Atlantic Coast".[8] Only 280 miles separate the towns by land but the fluvial trip covered more than 3,000 miles. It was obvious that a land route was needed. Within that same year, the Federal government became involved in the highway building business.

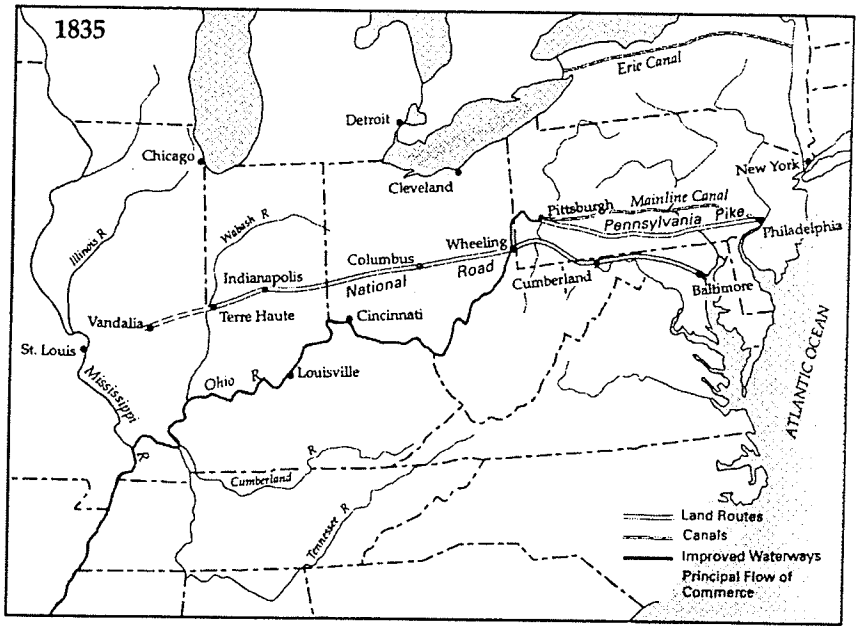


Figure 6
The National Road
From Raitz, K. et al. The National Road, (Baltimore: The Johns Hopkins University Press, 1996) p.196.

10 THE NATIONAL ROAD

The early American highways were macadamized, compacted mud, gravel or wooden planks. For the most part, maintained roads radiated out from urban centers and dissipated in rural fields. Towns sustained themselves through local industry and production so there was little need to develop or maintain highways beyond the city boundary. However, as the country's economy expanded and new towns incorporated further inland from major fluvial arteries, there was a need for efficient ground transportation. In 1808, the Federal Government passed the first highway act to address poor road conditions. The project, majestically named the *National Road*, set ambitious goals considering the infancy of the nation (Figure 6). It set out to link the established East coast with the emerging towns in the western frontier. Beginning in Cumberland, Maryland, it passed through Wheeling, West Virginia, across the Appalachian Mountains and ended in Valdalia, Illinois.[9] While still difficult to travel, the National Road represented a significant conquest of geography and road building competency.[10] What is important to recognize in early highway building programs is that building infrastructure was a way of colonizing new regions and staking a claim to its mineral wealth. In as much as it linked new towns, the highway was the first step in establishing the economy of undeveloped areas. It attracted settlement along its edges. By the mid 19th Century however, the *National Road* was all but forgotten as the railroad supplanted horse and coach travel as the dominant form of ground transportation. But the federally funded continental highway program would be revisited with the introduction of the automobile almost a century later.

Could it be that Americans are a restless people, a mobile people, never satisfied with where they are as a matter of selection? The pioneers, the immigrants who peopled the continent, were the restless ones in Europe. The steady rooted ones stayed home and are still there.[11]

John Steinbeck, *Travels with Charley: In Search of America*

11 MECHANIZATION

The mechanization of movement is fundamental to the creation of Interstate City. Additionally, the transformation of labor practices in the 19th Century marked a monumental leap in the acceleration of all aspects of human relationships. In farming, the advent of the reaper and tractor allowed for faster methods of cultivation, which subsequently produced greater yields.[12] The surplus this created could not be consumed locally thus strengthening the export and trade relationship between the farm and the city. Within the same generation, the railroad became part of the mechanization equation. It was the economic artery for exporting these goods to new markets miles away. Concurrently, individual land holdings increased (as harvesting required less manual labor hours) creating a still greater surplus. Interestingly, the railroad's efficiency highlighted the inadequacy of the supporting road network. The rail succeeded in transgressing great distances but like the river and canal system before it, did nothing to address the problem of rural roads. The railroad gave advantage to those whose land was close to the elevator or who were fortunate (or wealthy) enough to have a well-maintained road surface leading to it. The farmer who lived a hundred miles away was at an obvious disadvantage. Muddy roads often made passage impossible, costing the farmer valuable time and money.

12 THE LINCOLN HIGHWAY

As city roads were paved and extended into the country, interest grew for a transcontinental highway. The introduction of the Model-T for a mere $525, created a demand from the new motoring public to pave public roads outside the city (Figure 7). The *Lincoln Highway* was the first major federal roadway[13] conceived specifically for the automobile. Before the *Lincoln Highway*, a succession of connecting municipal roads and frontier trails was the only way to cross the continent. At the turn of the century, very few roads were even paved and most were unsuitable for the influx of automotive travel. The *Lincoln Highway* built upon a nationalist agenda in an effort to unite the country from coast-to-coast.

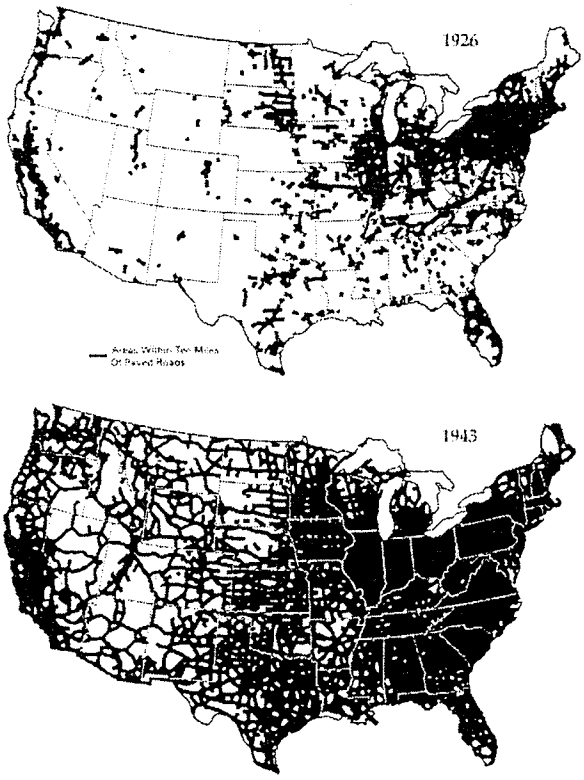


Figure 7
Paved Roads in America, 1926 and 1943.
From Raitz, K. et al. The National Road, (Baltimore: The Johns Hopkins University Press, 1996)

Around the same time, the colorful names of highways and turnpikes like the 'Liberty', 'Lincoln' or the 'Washington' fell to impulse of standardization. In an effort to systematize the nation's road networks, the American Association of State Highway Transportation Officials (AASHTO) was formed in 1926. It proposed a new numbered system to replace named highways that overlapped and often followed one another. By year's end, for example, the Lincoln Highway, as it was originally known, had been divided into the US 1, US 30, U.S. 530, U.S. 40, and U.S. 50. The establishment of the route system marked a significant shift in the ideology of highway building and gave a hint at what was to come; the numeric representation of roads was a centralizing act of power. It afforded easy quantification of local roads, each with its own colorful history, into a neutral, national database of integers.

13 AN UNFAIR COMPETITION

> *Not so long ago (a century or there-abouts), Gammas, Deltas, even Epsilons, had been conditioned to like flowers - flowers in particular and wild nature in general. The idea was to make them want to be going out into the country at every available opportunity, and so compel them to consume transport.*
>
> *Huxley, Aldous.* Brave New World, (New York: Harper & Brothers,1932), 22.

Before 1956, less than half of all U.S. households possessed an automobile. The majority of the population traveled less than 5 miles to work on light rail lines or local bus routes and automotive travel was largely confined to one region. Trains more easily accomplished inter-regional travel, as the roads were still unreliable. Once the Federal Government committed itself seriously to the construction of a road network, the train companies could not complete. The new Interstate linked greater markets, offered choice of routes and the freedom from schedules. With all the apparent benefits of road travel, the rail companies did not stand a chance. Automakers continued to weave together life and machine making it impossible to live without a car.

At the same time other forces were at work. Beginning in the late 1920s, General Motors began secretly buying local rail companies in cities across the conspiracy was revealed and Mack Truck, Firestone, Standard Oil and GM were indicted on federal antitrust charges. By this time however, the damage had already been done. The destruction of the nation's light rail lines had cleared the way for the automobile to control mobility and dictate the direction of federal policy regarding financing of infrastructure projects (Figure 8).[14]

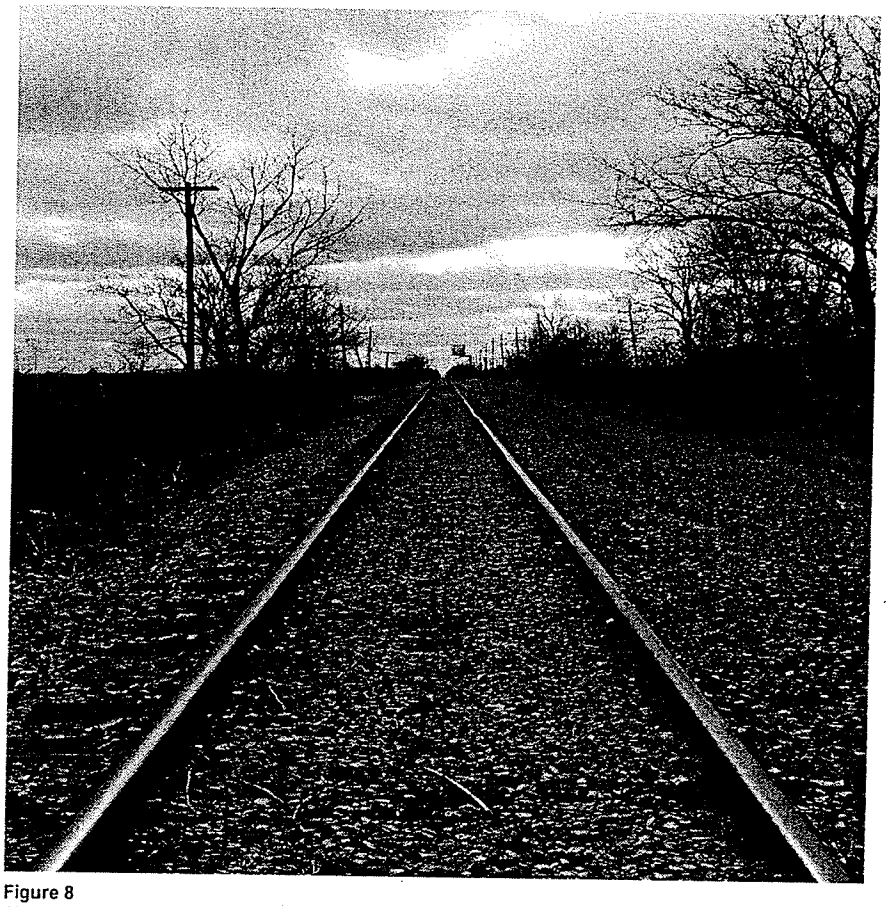


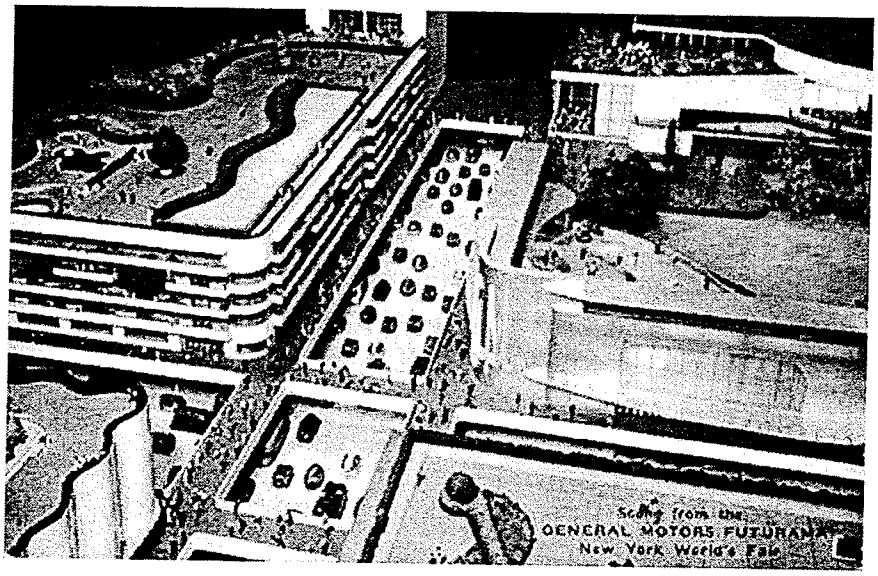
Figure 8
Abandoned tracks

Once under their control, the lines were decommissioned, the tracks torn up and the overhead wires removed. To fill the void left by the trolleys, GM proceeded to sell their own manufactured buses to the cities. More than 100 cities from Los Angeles to New York were reconfigured by General Motors to move off the tracks and on to pavement. The car giant also convinced other stakeholders in road building industry to help further their cause. In 1947, the conspiracy was revealed and Mack Truck, Firestone, Standard Oil and GM were indicted on federal antitrust charges. By this time however, the damage had already been done. The destruction of the nation's light rail lines had cleared the way for the automobile to control mobility and dictate the direction of federal policy regarding financing of infrastructure projects.[15]

By the 1930's, interest in a national network of superhighways was growing across the country[16] and the incredible popularity of the automobile was creating pressure at the federal level to accommodate its potential. By the end of the decade, the 27 million automobiles registered in the U.S. still drove on what were essentially expanded carriageways[17]. While the Lincoln Highway and the U.S. Route System initially addressed the needs of the automobile and regional travel, the type of uninterrupted, high-speed corridors that the automobile demanded, had yet to arrive.

14 GRADE SEPARATED INTERCHANGE

In Central Park, F.L. Olmstead recessed the cross-town roadways to reduce their visual impact on the landscape. By separating the grades of two intersecting paths, each one is permitted to continue without disruption, one going above, the other below. The first grade separated interchange for highways came almost seventy five years later at the intersection of Highway 4 and 25 in New Jersey. The Woodbridge Cloverleaf rejected the use of stop signs or signals and creating a simple but ingenious way to wind intersecting trafic into a continuous pattern of movement. By the time of the Interstate Highway Act in 1956, the grade-separated interchange was recognized as the best method for controling high volume trafic interchanges



"All roads lead, as they have for centuries, to the great centers of commerce and communication. As the continental highway now leads us to the City of tomorrow. Here the city first receives its goods and produce from the factories and the fields of the world. Plazas of urban living rise over freeways. Vehicles electronically paced, travel routes remarkably safe, swift and efficient. Towering terminals serve sections of the city; make public transportation more convenient; provide ample space for private cars. And from a lower level, covered moving walks radiate to shopping areas that are now truly — marketplaces of the world."

from General Motors 1964 Futurama exhibit audio narration (General Motors, 1964). transcripped published at: http://www.phrenicea.com/futurama_chip.htm

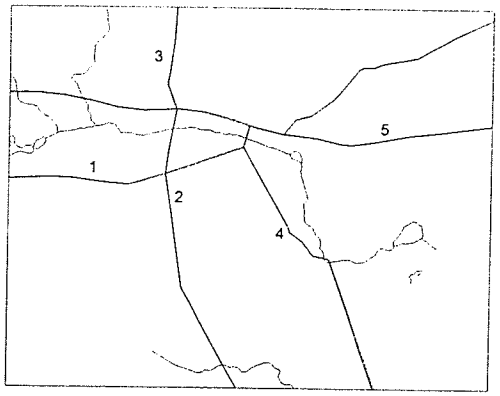
Figure 9
Futurama model
from Rosenblum, Robert et al. *Remembering the Future: the New York World's Fair from 1939-1964*, (New York: Rizzoli, 1989)

15 1939 WORLD FAIR: FUTURAMA

To understand the mobile dreams of automakers and designers and the social climate at the time, one need only refer to the 1939 World's Fair in New York. Dubbed *The World of Tomorrow,* it was the first exhibition to embrace transportation technology as its major theme. Sponsored by the automobile industry, it recognized that 20th Century America was in the midst of a mechanical revolution that was capturing the imagination of the public. Over 3 million visitors came to the Corona Park site in Queens to see the vision of the automobile manufacturers, one where the automobile and the highway were the centerpiece of the future.

The *Futurama* exhibit in the GM Pavilion was the most popular exhibition at the Fair (Figure 9). Designed by Norman Bel Geddes, the display was of a network of super highways for the year 1960. Geddes envisioned a system where vehicle spacing would be regulated by radio beams at speeds up to 160 km/h along 14 lane roadways. The design separated city traffic by type allowing for increased efficiency and better flow.[18] Similar to Olmstead's Central Park design and Corbusier's Contemporary City, the type of movement determined its location within the stratification of the system; the lowest grade would be occupied by service-oriented facilities while the top tiers would be for expeditious travel. He optimistically estimated a cross-country trip of the future to take less than 24 hours (today, it takes 59). Although not all of Geddes proposals were adopted or even possible, his vision of a national transportation system helped popularize the concept of Interstate travel.[19] It also prophesized the urban dispersal plans like Wright's Broadacre City that became a reality by mid Century (See Chapter 3.2).[20]

The 1940's saw the opening of the Pennsylvania Turnpike and Arroyo Seco Freeway in California. However, by the time the U.S. entered World War II, momentum for highway building had begun to wane as federal policy focused on building munitions rather than roads.[21] Although the war slowed the highway initiative, it did give the U.S. and General Eisenhower a chance to see firsthand the autobahn network in place in Germany. The Nazi's were able to efficiently amass armies from around the country through a network of limited access, grade separated highways.[22] It gave them a decidedly strategic mobile advantage over the Allies because at that point, inter-regional travel in the U.S.



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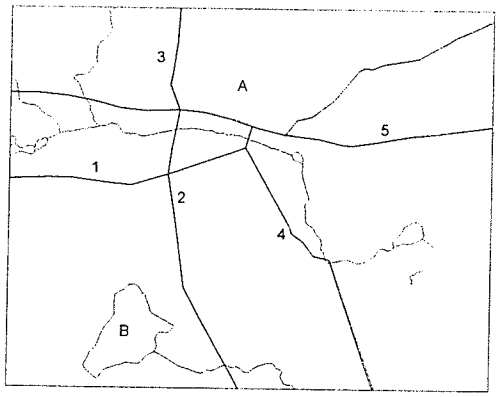

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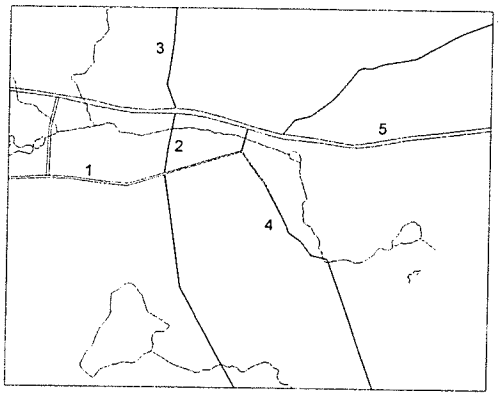

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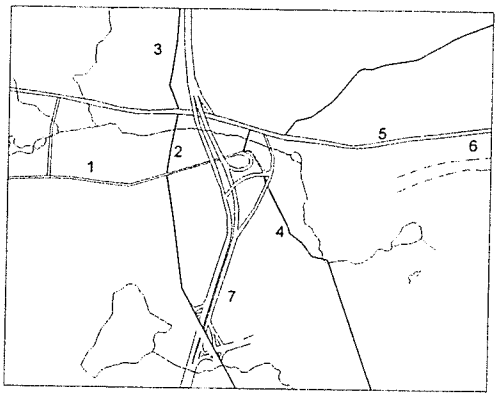

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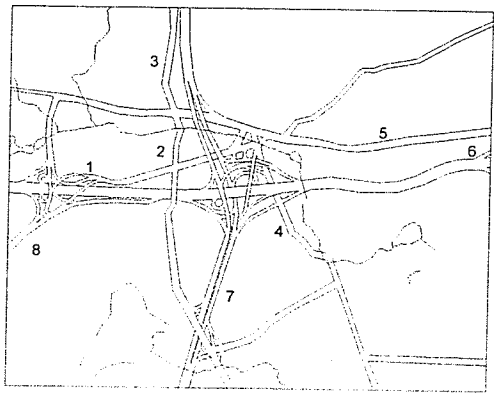


E

Figure 10
Parsippany Highway Development

A: 1854
B: 1900
C: 1954
D: 1970
E: 2002

was limited to two lane highways. Eisenhower would later recall "Germany had made me see the wisdom of broader ribbons across the land."[23] When the war ended, super-highway construction took on an important role in U.S. homeland defense strategy.

With the dawn of the atomic age, the U.S. needed a network of roads to coordinate a strong military presence should the country ever engage in nuclear warfare. "In the case of an atomic attack on our key cities, the road net must permit quick evacuation of target areas, mobilization of defense forces and maintenance of every essential economic function."[24] Whether or not the building of the Interstate Highway System was required to fulfill this purpose is debatable but marketing it as a defense strategy helped popularize the project in Congress and among the American people.

16 1956 INTERSTATE HIGHWAY ACT

The Interstate Highway building program marked a return to the large-scale construction projects that characterized much of Depression Era federal building projects. Like the Hoover Dam, Interstate City displays coolness in execution and an unwavering confidence in scale. A look at a map of the U.S. Interstate Highway System shows its incredible breadth and completeness in all corners of the country (Appendix B.14).

The Interstate Highway and the Highway Trust Fund insured the success of automotive travel and the dissolution of public mass transit. By investing heavily into roadwork infrastructure, the federal government effectively changed the direction of American mobility. When the automobile began to dominate roads once used by pedestrians, carriages and bicycles, lawmakers approached Henry Ford to help finance the construction of new roads. Ford however was adamant that the responsibility for new road construction belonged to the federal government rather than the automotive industry. This would prove monumental in drafting future financing legislation. In the history of Interstate construction, the federal government has spent over $329 billion. Had carmakers been made to build the infrastructure for their products like the railroad companies a half-century earlier, the plotting of the nation's road system may have taken a different form.[25]

17 HIGHWAY CHRONOLOGY[1]

1808	The National Road begins construction.
1820	Beginnings of the fur trade in the West.
1821	William Becknell opens the Santa Fé Trail
1824	Trappers open up a route across the Rocky Mountains, which is to become South Pass.
1825	The Erie Canal is opened, connecting Albany and Buffalo in upstate New York.
1826	Jedediah Strong Smith is the first white man to cross the Rocky Mountains and reach Southern California. He repeats the feat in the next year.
1827	Independence, Missouri, is founded, and soon becomes the starting point of the trails to the west.
1828	First U.S. railroad, Baltimore & Ohio, was begun.
1841	Treks on the Oregon Trail become regular annual affairs.
	First wagon train for California left Independence, Missouri
1844	Samuel F. B. Morse patents telegraph.
1849	News of California gold rush leads to new wave of migrants on the trails.
1858/61	Butterfield Overland Post links St. Louis and Los Angeles by way of El Paso.
1859	Near Titusville, Pennsylvania, Edwin Drake succeeds with the first oil drill.
1860	Pony Express established, connecting Missouri and California.
1869	On May 10, a golden spike driven into a crosstie at Promontory, Utah, marks the completion of the first transcontinental railroad.
1872	Congress founded first National Park, Yellowstone.
1877	A. L. Barber founds Trinidad Asphalt Company and paves the first streets in Washington DC with asphalt.
1880	Railroads reach Santa Fé; the Santa Fé Trail falls into disuse.
1882	Rockefeller's Standard Oil Trust is first national monopoly.
1883	The Santa Fé Railroad connects Los Angeles, Santa Fé, and Kansas City.
	Completion of Brooklyn Bridge in New York.
1884	The Northern Pacific Railroad links Seattle and St. Paul, Minnesota.
1886	Karl Benz builds the first motor car.
1888	J. B. Dunlop invents pneumatic tire.
1889	Indian Territory in Oklahoma is opened to settlers; within 24 hours, 50,000 settlers staked claims.
1892	Diesel engine patented.
1893	Frank and Charles Duryea of Springfield, Massachusetts, build the first American motor car.
1895	The first gasoline-driven automobiles are sold by the Duryea Motor Wagon Company of Springfield, Massachusetts.
1896	Buffalo, New York, is the first major American city that has its streets paved.
1898	The first "Stanley Steamer" is commercially available.
1900	The first steering wheel is built into a Packard "Ohio," replacing steering poles.
	Cars powered by electric energy outnumber gasoline-driven ones by two to one.
	Oil is discovered in Texas.
	Oldsmobile introduces the speedometer.
1903	Henry Ford founds Ford Motor Company.
	Winning a $50 bet, Dr. Horation Jackson succeeds in crossing the U.S. in a car. Accompanied by a chauffeur and his dog, he is on the road for 65 days.

[1] Compiled from http://www.univie.ac.at/Anglistik/easyrider/data/TimelineOverview.htm; Department of Transportation and American Auto Association data; http://inventors.about.com/library/inventors/blasphalt.htm; Asphalt Contractor Magazine (February 1999)

1904	Campaigns for the improvement of roads are under way.
	Henry Ford sets a speed record — 144 km/h
	New York City Subway is opened.
1905	Some 75,000 cars are on American streets
1907	The first gas station opens at St. Louis.
1908	General Motors founded.
	Ford introduces the Model T car, priced at $850.
1909	The first country road is being paved.
1910	Hot tar patented
1912	In Redlands, California, the first street markings are introduced.
1915	A total of 2.3 million cars is reached.
	Lincoln Highway, the first transcontinental road, is marked.
1916	The "Federal Aid Road Act" introduces federal financing of highway construction.
1918	Wisconsin introduces the system of numbered roads and highways.
	First traffic light (with three colors) is installed.
1919	Dwight Eisenhower directs a military convoy across the country; the excessive duration (two months) makes necessary the proper pavement of roads.
1920	First regular licensed radio broadcast begun Aug. 20.
	Federal census record an equal number of people living in cities as on farms for the first time.
1921	The first original White Castle hamburger stand (in Wichita, Kansas) introduces the era of fast food.
1922	Doughnut tires and gas gauges are introduced.
	The Ford Motor Company manufactures nearly half of the new cars and trucks in use in the U.S.
1925	The system of numbering the federal highways is introduced.
	The first motel is opened in San Louis Obispo, California.
1926	Route 66 is established, stretching from Chicago to Los Angeles.
1927	Ford discontinues assembling the model T after producing over 27 million.
	Lincoln Highway, the first coast-to-coast transit road, is all paved.
1928	The first highway interchange in the nation is built in Woodbridge, New Jersey.
1935	Howard Johnson develops the system of franchise restaurants.
	The first parking meters are introduced.
1936	Boulder Dam completed.
1939	At the The World's Fair in New York, Norman Bel Geddes advocates a system of limited-access highways.
1940	The total number of cars in use in the U.S. exceeds 20 million.
	Pennsylvania Turnpike and Arroyo Seco Parkway (today's Pasadena Freeway) are opened to traffic.
	First branch outlet of Dairy Queen is opened.
1944	The national system of interstate and defense highways is approved by Congress.
	The nationwide speed limit is set at 35 mph (48 km/h)
1947	Death of Henry Ford.
1949	The Volkswagen Beetle is introduced to America.
	Richard and Maurice McDonald come up with their cheap and perfect fast food.
	Ray Kroc opens first franchised McDonald's in Des Plains, Illinois.
1952	The first Holiday Inn opens at Memphis, Tennessee.
	New Jersey Turnpike is opened to traffic.
1956	The Interstate Highway Act is introduced. Over 40,000 miles of high speed roads are planned to be built largely with federal money. First estimates of the costs are near $27 billion; until today, more than $125 billion have actually been spent.

Figure 11
Blurring

3

Shifts Emergence of a new form of settlement

3.1 Acceleration: a city for speed

> *"The splendor of the world has been enriched by a new beauty- the beauty of speed."*
>
> Banham, Reyner. *Theory and Design in the First Machine Age*, (New York,1967), 287.

Interstate City is the response to an ever-accelerating culture. From the radius of its on ramps to its even layer of asphalt surfacing, it builds according to a culture bent on-speed. Since the mechanization of movement began over a century ago, the way we move through space continues to accelerate. Infrastructure often instigates these mobile changes but more often then not, built form plays catch up to vehicular innovations (Appendix B: Figure B.8). With increased speeds came improved roads. As we float effortlessly between regions, the borders with which we once defined our lives become meaningless markers within a continuous line of development. This blurring and foreshortening of distance coupled with the compression of time sets the tone for the creation of a new form of settlement.

Before the Model-T, most people never ventured further than 20 miles from their home during their entire lifetime. In 1938, Americans traveled a total of 271 million miles. By 1956, the year of the Interstate Highway Act, the 59,348,059 motor vehicles in use in the United States traveled 700 million miles. Now, less than fifty years later, there are over 213 million vehicles on the road consuming 2.7 billion miles per year with each registered driver averaging 12,484 miles per year (Appendix B: Figures B.1 – B.7). We take for granted the ability to travel 70 mph between regions when less than a century ago we remained bogged down in the mud.

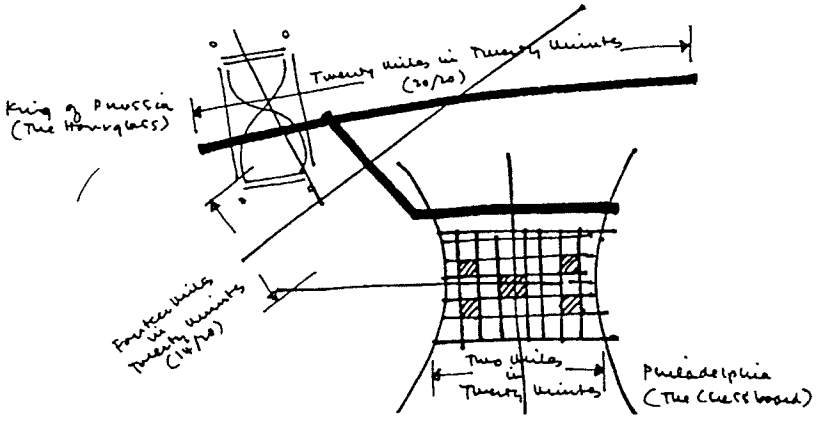


Figure 12
Interval
from Kieran, Stephen and Timberlake, James. "Paradise Regained", *Architecture.* December, 1991, p.50.

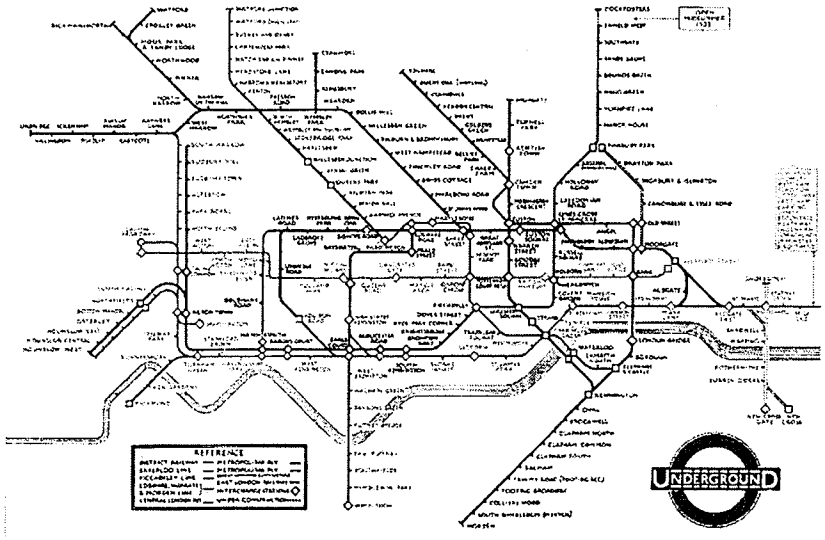


Figure 13
London Tube Map, Harry Beck (1930)
http://www.thetube.com/content/history/beckmap1.jpg

As our collective speed increases, the shape of our cities and infrastructure is reworked. Pierce Lewis writes of the mobile succession whereupon the dominant national transportation system is replaced when technologic innovation offers a better (faster/more efficient) system.[26] From rivers to canals to railroads and ultimately to Interstate City, antiquated infrastructure (independent of its present scale or economic worth) has been replaced. Once the railway could ship coal more easily than the canal barges, the water network began a steady decline. Similarly, when the railroad could not compete with the automobile in terms of access and freedom, it fell into disrepair. This shift to automotive and highway travel however, has proven to be substantially different both in terms of its incredible breadth and the enthusiasm with which the private and public sectors have embraced it.[27] In less than 200 years these increases in speed have redefined the built landscape.

This new found mobile freedom provokes new ways of thinking about our built world. It pits conflicting notions of solidity and space (geography) against metaphysical ideas of fluidity and transience. While impressive in form, the shape of Interstate City is born of its ability to process movement within. In this sense, it is Alex Krieger's transient American city, a temporary and unfinished[28] form unable to completely overcome the "immense geography" (that of untamed nature) or the speed of its desires.[29] The [city] has no weight, it seems barely to rest on the soil...born temporary [it has] stayed that way...The result is a moving landscape for its inhabitants."[30] Unlike the European city, Interstate City develops to expedite processes rather than to establish points of stasis. It is built to suite a perpetually accelerating population whose desire for mobile freedom dictates its direction and spatial constitution.

18 TIME/DISTANCE/INTERVAL

Interstate City reworks the idea of distances and hence boundaries, based on the acceleration of movement. As presented by Kieren and Timberlake, distances collapse in Interstate Highway travel. 2 miles of grid streets in central Philadelphia for example equals 20 miles of Interstate Highway travel in a twenty minute interval (Figure 12). "With time-not distance- as the measure, this new city is arguably as dense as the conventional city".[31] The abstraction of the spatial relationships of Harry Beck's 1930 map of London's railway and emerging subway system (Figure 13).[32] By abstracting the landscape into a series of connecting nodes where distances are graphically represented, the map offers a

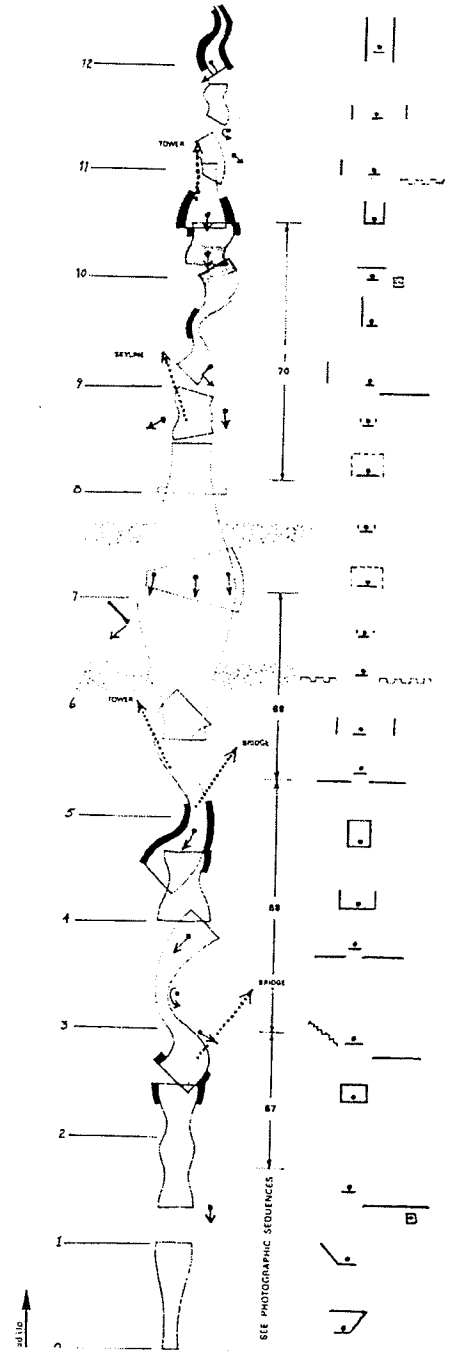


Figure 14
Interval
from Appleyard, D. et al. *The View from the Road*, (Cambridge Massachusetts: M.I.T. Press, 1964)

more legible reading of the transportation network as it relates to the city. It emphasizes the location of places relative to one another rather than their geographic position in the landscape. In "The View from the Road", Kevin Lynch takes this mapping idea a step further by quantifying distances in terms of their temporal meter (Figure 14). In his study, a six and a half mile drive down the highway is represented along a twelve-minute line spatially divided into one-minute intervals.[33] Looked at another way, a 2.5 second reaction time delay while traveling at 70 mph adds 257 feet to the 583 feet it takes to come to a complete stop.[34]

In the context of time and space, it would seem that Interstate City has already produced an abstracted map of its own. Rand McNally's time/distance map uses straight-line segments to connect cities independent of the geography that separates them (Figure 15). This map seems more representational of Interstate City than even the Interstate Highway road atlas (Figure 1, see also Appendix B: Figure B.14). We begin to see the highway and in fact the country not as a distances but intervals of time.

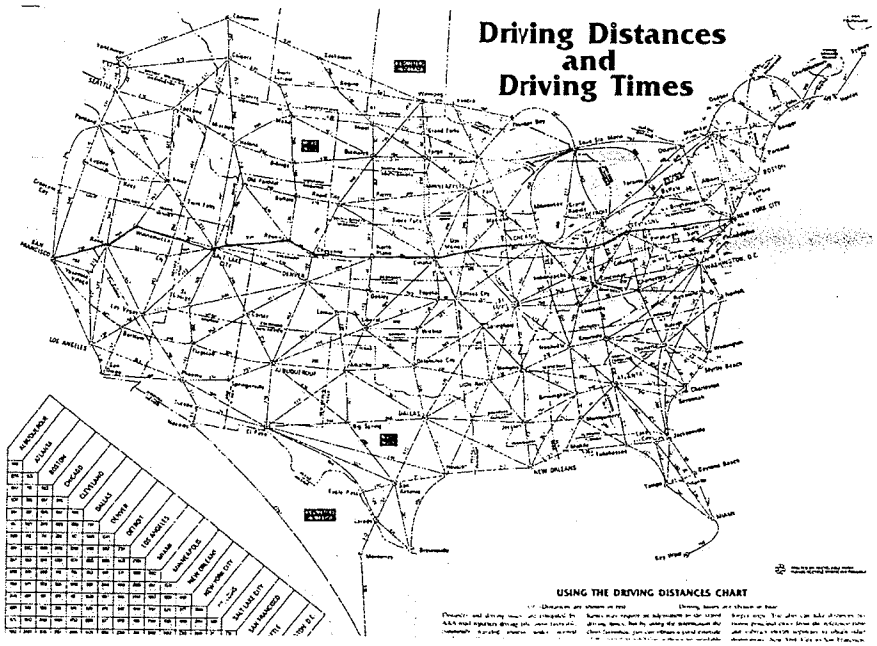


Figure 15
Time-Distance Map
from American Automobile Association United States of America Road Map (2000)

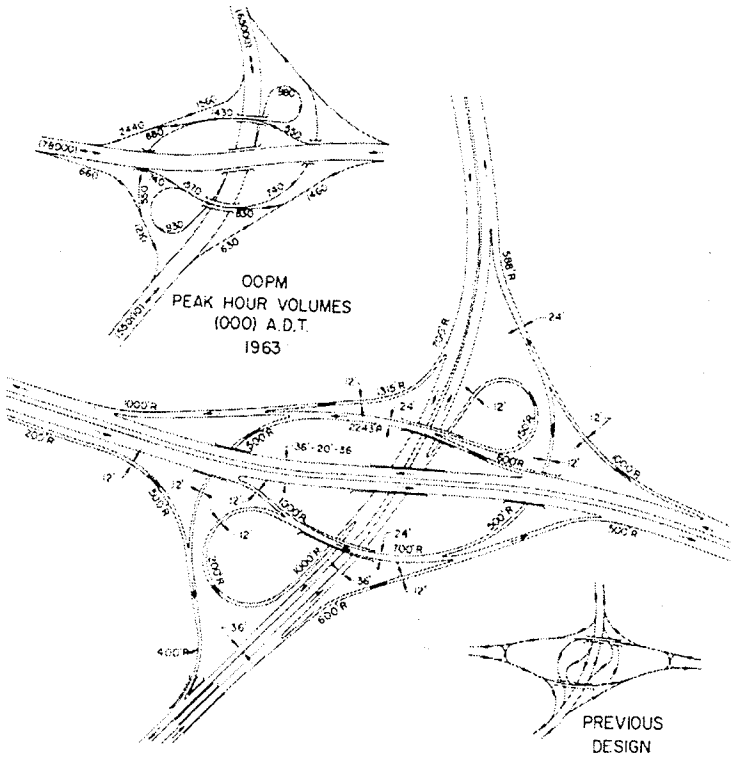


Figure 16
Directional interchange, two semi-direct connections
from AASHTO, *A Policy on Geometric Design of Highways and Streets: 1990*, (AASHTO: Washington, D.C., 1990), 919.

Figure 17
I-80Overpass, Western Pennsylvania

19 RAMP

The grade-separated interchange is the only type of interchange allowable in Interstate City (the stop sign, traffic light or even the round-about are outlawed, relegated to cities less concerned with the prospect of stasis). Interstate City has developed intricate patterns of ramps to control and direct movement as required. The Diamond, Cloverleaf, Parclo, Stacked, Trumpet and Directional 'T' are terms that describe both physical spaces and patterns of movement (Appendix B: Figures B.13). They are constructs created by a culture committed to maintaining continuity of movement above all else.

The acceleration of traffic and the transition from distances to intervals is manifest in Interstate City through its on-ramps. Interstate City is made up of a series of interconnected highways that rarely terminate. Instead, they seamlessly connect with one another to reroute traffic in a new direction (Figure 16). The interchange ramp is the physical expression of movement as it changes direction (Figure 17). From 0 to 70 mph, it is the threshold between stasis and engagement in Interstate City. Reyner Banham describes its elegance: "...the Santa Monica/ San Diego intersection is a work of art, both as a pattern on the map, as a monument against the sky, and as a kinetic experience as one sweeps through it."[35]

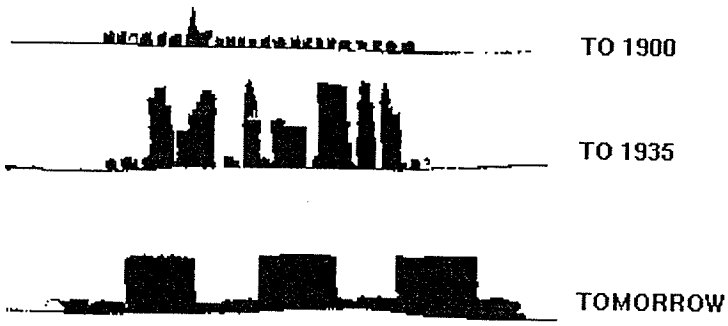


Figure 18
Contemporary City
from Le Corbusier. *The City of To-morrow*, trans. F. Etchells, (London: The Architectural Press), 1929.

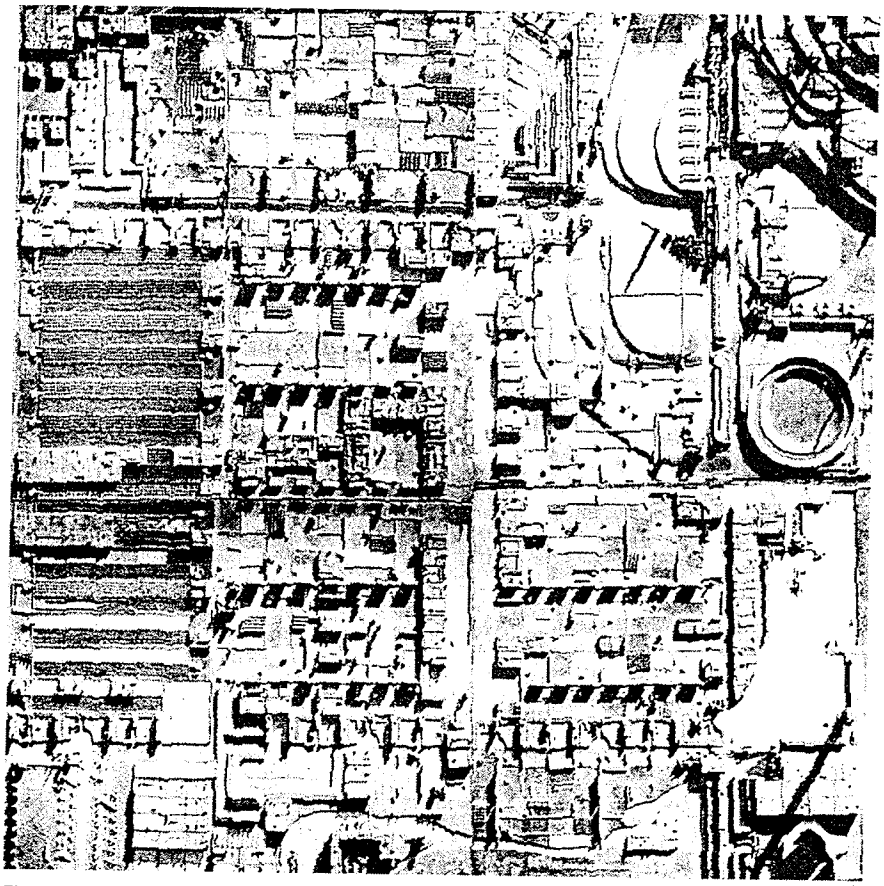


Figure 19
Broadacre City
from Wright, F.L., The Living City, (New York: Horizon Press), 1938.

3.2 Decentralization

The highway enables the decentralization of the traditional city. It allows an accelerated culture to disperse itself at will across the landscape. The shift from urban city to Interstate City (or from center to unfurled line) begins to determine who and how the inhabitants of this new city will settle. By looking at the influences of the urban exodus and at early proposals addressing the city-machine relationship, Interstate City can be seen within the historic continuity of decentralized urban planning.

20 CENTER

Interstate City has no center. Historically, the center was the ideological and symbolic anchor of the city and its inhabitants. In the Generic City described by Koolhaas, the core is no longer the historic meaning center. History, as an identifiable construct, is fading.[36] Utopian suburban developments spring up outside the core, even outside the periphery as entire communities are planned, executed and inhabited. There is no need for a beginning point - a terminus that simultaneously marks a development's birth and death. History, density and identity are created in an instant. The centerless city is a backdrop to the myriad of ideas and values of all cultures on one specific culture for one specific place.

21 UTOPIA

In the first half of the 19th Century, America was coming to terms with the urban implications of the mechanical revolution. As cities were becoming increasingly populated and vertical, it became apparent that the automobile was out of sorts with its urban context. The old city was a city built for pedestrians, not machines. The grid layout of its streets was unequipped to handle the unbridled expansion of the automobile. The freedom of movement promised by mechanization was being suffocated by its own success. Cobblestone streets were filled with horse and carriages, automobiles, pedestrians and bicycles vying for position and right-of-way.

The machine was transforming the relationship of people and the street, and of the city and the landscape. Spatial values, once the determinant of the built world, were

being supplanted by temporal values as speed and mobility increased.[37] In dealing with the new spatial requirements of the automobile, architects dreamed of utopian garden-machine relationships. For the most part, these visions called for the decentralization of the city and greater connections to the land.

22 COMMUTER RAILROAD

Before the automobile solidified the current suburban plan, the railroad provided the first real opportunity for a city-country (work-live) relationship. Initially, the wealthy classes built stately homes outside the increasingly industrialized urban centers. Nearby towns that once existed in relative autonomy were brought within the "metropolitan orbit" as the railroad "dissolved the barriers of time and distance."[38] Within the suburb, settlement tended to canalize along the tracks.[39] Walking time to the railway station limited its outward growth to a manageable distance. Although this hardly represents a significant decentralization of the city, it began a pattern of regional settlement derived from the parameters of mechanized transport and related infrastructure.

The linking of rural and urban settlements was symbolic in reconciling moral strength (country) and cultural refinement (town). In the second half of the 19th Century, transcendentalists viewed rural America as a place for contemplation rather than a place for hard agrarian work.[40] It was perceived as the principled alternative to the increasingly crowded and corrupt urban centers but they soon came to realize the isolation and loneliness inherent in a rural retreat. The advent of the railroad and the commuter suburb allowed "frequent intercourse with the city",[41] a welcome link between the two worlds.

23 THE CITY OF TO-MORROW

Corbusier's proposal for the *Contemporary City* called for the elimination of existing congestion in the center by diffusing said center into nodal towers separated by large expanses of pedestrian greenspace (Figure 18). His plan maintained the density of the skyscraper but placed it within a rural landscape. As in *Futurama*, traffic circulation was of the utmost importance. To maintain the surface space for pedestrian leisure, traffic was relegated to the underground. It was separated into functions based on the type of vehicle and the final destination of its journey. Interestingly, there was no allowance for a tramway and the railroad was used primarily for cargo transport. On the surface, the Contemporary City was a city for people, with the automobile as the primary means of transportation.

24 BROADACRE CITY

Frank Lloyd Wright believed that mechanical exaggerations and the skyscraper were the gravestone of capitalist centralization.[42] The congestion of the city suffocates the individual, hindering personal and spiritual growth. Salvation for the city lay in liberal and deconcentrated ground use.[43] He wrote, "crowding is a ruse and has no beneficent solution except to inspire us to plan the new city."[44] His plan for Broadacre City addressed these issues by allotting each individual one-acre of land and positioning houses among well-treed, curvilinear streets (Figure 19). This new sense of spacing was the first step toward true democracy through a decentralized city. Though described as "organic living in nature", Broadacre City ironically relied heavily on the mechanical forces that Wright determined to be destroying the old city. A mass transportation network (much like the commuter suburb of fifty years earlier) offered an escape from the "urban cage". [45]

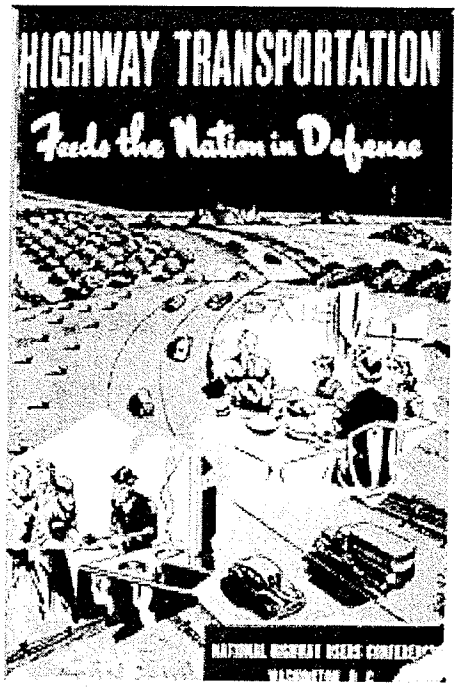


Figure 20
"Highway Transportation Feeds the Nation in Defense" from The National Highway Users Conference, Washington: 1956.

More than any single action by the government since the end of the war, this one would change the face of America. ... Its impact on the American economy - the jobs it would produce in manufacturing and construction, the rural areas it would open up - was beyond calculation.[46]

D. D. Eisenhower, *Mandate for Change 1953-1956*

25 DEFENSE THROUGH DECENTRALIZATION

While designers were dealing with the impact of the automobile on the city, the cultural climate of the country and the world was changing. The threat of atomic attack on large American cities became a real concern of the federal government. Today faded black and yellow fall-out shelter signs within many cities denote the location of chambers built in the 1950s. While the weapon may have been new, the initial urban strategy to defend against it certainly was not. The "magical purpose of war" as Lewis Mumford describes the process, created "elaborate systems of fortifications, with walls, ramparts, towers, canals".[47] But the impact of an atomic bomb could not and cannot be defended against by simple reinforcement. As a secondary pre-emptive measure, the physical composition of the city was called into question. As described by Tom Vanderbilt in *Survival City*, the Cold War was a war of engineers, not soldiers that transformed the domestic landscape.[48]

The density of cities was seen as a liability that would result in significant loss of life in the event of an attack. Large cities were perceived to be more prone to being targeted than small towns.[49] By dispersing the cities to smaller centers, potential casualties could be minimized (Figure 20). While there was no official government policy or program, it is interesting that around the same time the city began to seriously disperse, congress was already setting out the framework for the infrastructure that could support such an urban reorganization.

The 1956 Interstate Highway System plan and a 1941 proposal for a strategic military highway network are indeed similar (Figures 21, 22).[50] The years building up to the 1956 Interstate Highway Act were overshadowed by continual U.S. military conflict overseas. The threat of war influenced highway-building policy and helped popularize the idea of high-speed roadways. In 1940, Franklin Roosevelt advised congress that the following was necessary: [A] special system of direct interregional highways, with all necessary connections through and around cities, designed to meet the requirements of the national defense and the needs of a growing peacetime traffic of longer range.[51]

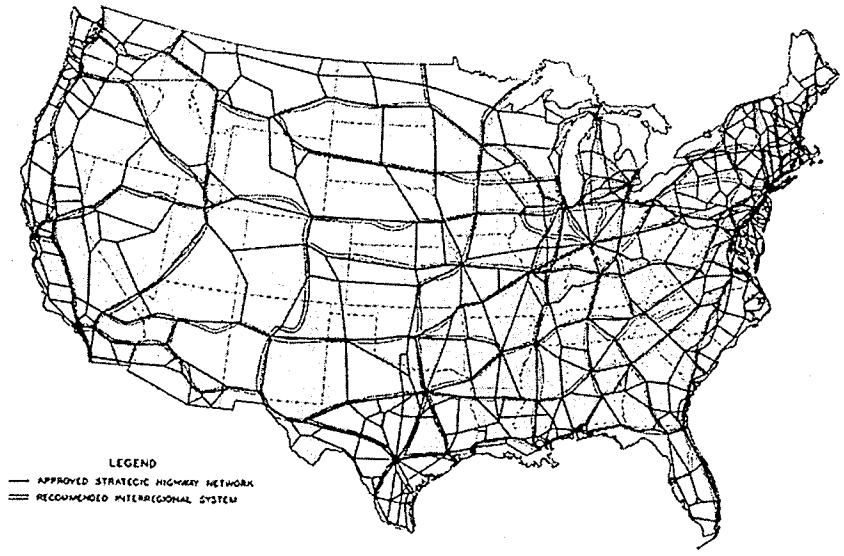


Figure 21
1941 proposal for Military Highway Network
from Raitz, Karl ed. *The National Road* (Baltimore: The Johns Hopkins University Press, 1996)

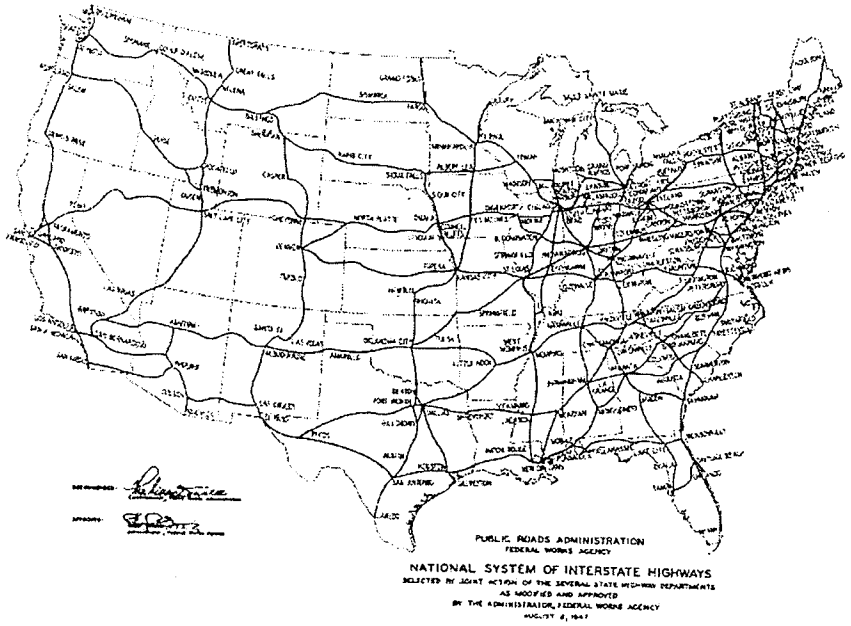


Figure 22
1947 Plan for National System of Interstate Highways
from the Yellow Book, (Washington, D.C.: Public Roads Administration- Federal Works Agency,1947)

26 IMPLEMENTATION

The commuter railroad, garden suburb, Broadacre City, Contemporary City, and the defensive military plan all sought relief from the constraints of the city through decentralization. Each saw the congestion of the traditional city as an impediment to the freedom and well being of a mechanized society. But while they differ in terms of their formal and aesthetic representations, they are linked in at least two regards: their intensive development of transportation infrastructure and their reliance on the automobile to accomplish their decentralization. The functions of automobile, truck, train or tram are all spatially delineated to maintain generous open spaces for pedestrian enjoyment. It is here that Interstate City breaks from these and other utopian urban visions. The impetus for the development of Interstate City is not the creation of untouched pedestrian open spaces but rather the calculated movement of people and goods from one place to another. Pedestrian space is barely even an afterthought in Interstate City. Regardless, these visions helped popularize the concept of a decentralized form of human settlement that would later characterize the spaces of Interstate City.

Figure 23
I-80/I-287 Interchange, Morris County, NJ.
From above, the decentralization of the American city is more easily visible. Note the line of Interstate City.
from *2002 GlobeXplorer, AirPhotoUSA*: published on www.mapquest.com

3.3 Line spatial organization of Interstate City

The current pattern of low-rise urban development has been perpetuated by Interstate Highway construction. While there are many socio-economic factors influencing this continued sprawl, it began with (and is dependent on) the success of the Interstate Highway. The road and infrastructure prospecting has always been the line which attracts settlement:

> *A road which for some reason has become established along an artificial line, a line not directly dictated by the formula of minimum effort, will "canalize" traffic, so that, even when an alternative and better way has been provided, institutions and towns and all that goes for human activity will have taken root along the way and all history will be deflected by the deflection of the Road.*[52]

Like the laying of the railway in the 19th Century, American prospectors staked claims alongside the Interstate frontier creating development in-between major cities. In pre-automotive times, roadhouses and small inns along macadamized roads were welcome relief for those riding the stages. Later, canals encouraged the industrial development of iron forges and shipping while the rail introduced new standards in hotel construction. The modern highway however, altered the face of the nation more than any other infrastructure project in the last century (Figure 23). It was not long before industries realized the potential of investing their fortunes along America highways. The highway was the new commercial main street where thousands of passer-bys from around the country congregated. In California, development occurred along the Strip, with buildings facing the passing traffic. Much of the Strip architecture catered to the freedom and accessibility provided by new high-speed freeways. Movie theaters, hotels, restaurants, malls and even churches all began to respond to by modifying their typologies to accommodate the automobile.[53] The drive-in, drive thru or drive-up archetype began out West but quickly became a model for the rest of the country.

100 years	asphalt bed use life
20 years	asphalt topping
10 years	automobile use limit
2 years	average office space lease
2 years	life span of orange line paint
5 days	UPS ground delivery for cross-country package
1 week	time between grass cuttings in center meridians
3 days	delivery time of Barnes and Noble on-line book order
8 hours	work day (plus commute)
1 min 32 secs.	Acceptable Drive-Thru transaction time
32 seconds	Big Mac preparation time
9 seconds	acceleration from 0 – 70 mph (approx)
5000 rpm	BMW @ 70 mph

Figure 24
Cycles

27 MEGASTRUCTURE

> *"...a large frame in which all the functions of a city or part of a city are housed. It has been made possible by present day technology. In a sense, it is a man-made feature of the landscape. It is like a great hill on which Italian towns were built."*

Maki, Fumihiko, *Investigations in Collective Form* (St. Louis: Washington University, 1964), 8.

The issue of permanence in a large project or city is comparable to the megastructural projects of the 60s and 70s (see Fumihiko Maki, Corbusier, Smithson, Archigram). Interstate City amplifies (unconsciously) the tenets of the megastructural project on a national scale. Conceding little to scale, it imposes rigorous order and direction on mobility across the landscape. The highway structure eliminates natural obstacles to create a man-made mobile environment around which programs can be structured. The *Comprehensive City*, while fantastical, illustrates many of these pervasive ideas: the conquest of regions, structural dependence, optimization of distance, and the containment and adaptability of program (Figures 25, 26). Its cross-section and plan demonstrate a complete disregard for the topographic variation and imposing structure that characterizes much of Interstate City. What is of interest here is the organization and ease with which programs can integrate into the system.

In Interstate City, the programs of the 'line' can be inserted and extracted without disruption to the whole, creating an infinitely changeable city. In some instances, Interstate City will cluster similar programs while at other times relationships between industries and services are more randomly determined (Figure 29). Regardless, their proximity to the highway and all its benefits places them within the community of Interstate City. Other than access and dependence on the highway, there is no programmatic doctrine to dictate development. As such, Interstate City can absorb almost anything. Like Beauburg, Interstate City proposes spaces where anything is possible[54] within a rational structure.

Interstate City has developed a structure that has become more than merely a framework for inserting programs. The structure itself has its own life and identity independent of the programmatic modules that tap into it while giving spatial order to these parts. It differs from other megastructure projects in that it is an open environment (relatively speaking), and promotes concentration of program along its edges while maintaining a relatively low density of use. The system creates an opportunity for larger units to be developed ('plugged-in') while attempting to "resolve the conflicts between design and spontaneity, the large and the small, the permanent and the transient."[55]

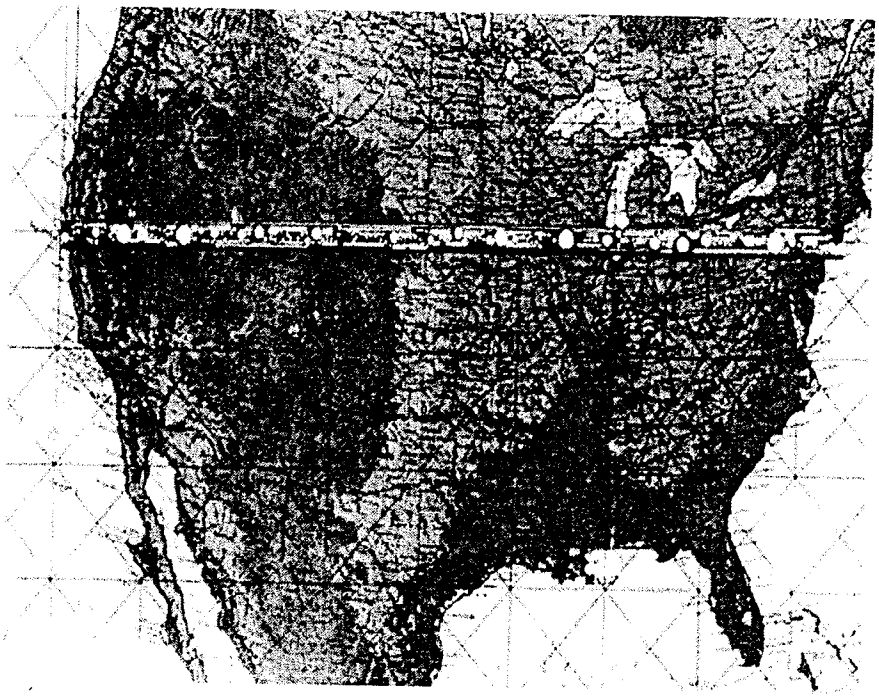


Figure 25
Comprehensive City: Plan
from Mitchell, Mike and Boutwell, Dave. "Comprehensive City", (Domus: January, 1969).

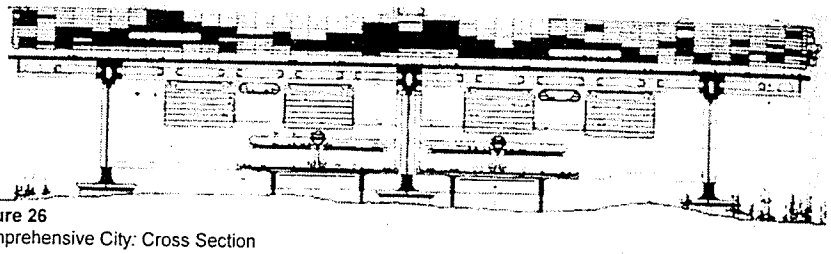


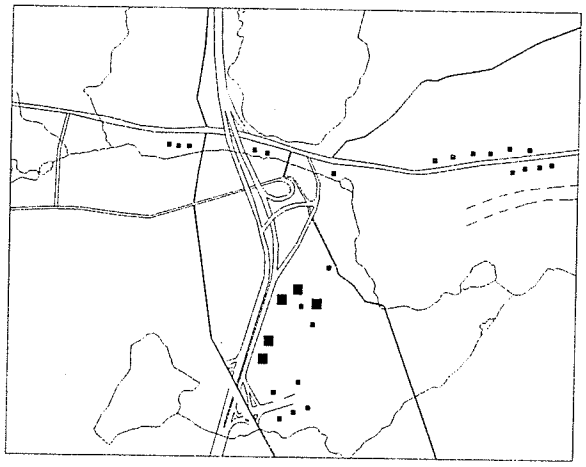
Figure 26
Comprehensive City: Cross Section
Ibid.

28 MODULE

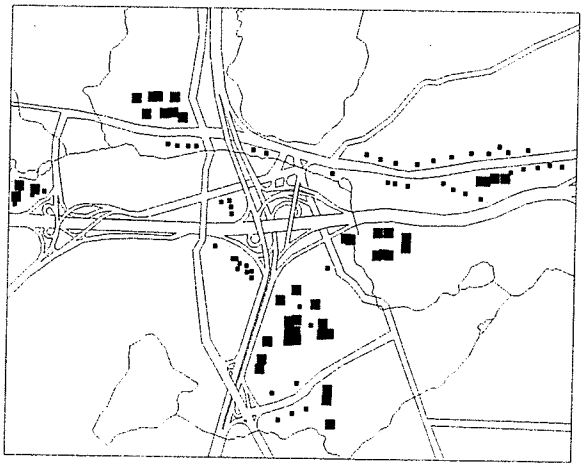
The module (or 'land bay'; 'garden') is not necessarily quantifiable in terms of lot size or zoning ordinance (although real estate speculation and development play a significant role in expanding the City) but is measured in temporal intervals (Chapter 3.2). The module has a longer cycle of use then the individual programs within it. Whether its aesthetic is of an English countryside, French formal garden, rolling prairie landscape or simply an open surface parking lot, these landscapes are likely to remain long after the programs inhabiting them have relocated.

Landscape berms, excavated valleys, perfectly aligned trees, diagonal parking lots with Swedish ball fixtures, a lake, a randomly curvilinear path, a wooden bridge, a creek, picnic tables anchored to steel posts embedded in concrete pads, and great lawns with pop up sprinklers. Park / Campus spatial organizations bring the worlds of work and play (public and private) closer together. By providing on-site amenities, (chef, gym, masseuse, doctor, grocery store) companies create a happy, consistently present workforce. The architectural theme of these parks can be anything from "Death Star" Internationalism to Swiss mountain chalet (see Appendix A.6).[56] In the end Interstate City accommodates any formal ideas of built space regardless of the stylistic overtures that neighboring modules may employ.

The continuity of built space in Interstate City is in the highway itself. Although shielded, camouflaged, and buffered, the highway is the omnipresent force that shapes the architecture of Interstate City. It determines proximity to exit ramps as well as the size and location of program. It perpetuates a disposable architecture, capable of accommodating all possible programs. It prefers clear span, horizontal structures with easily adaptable spaces and ample surface parking. Like the highway, roadside architecture has become regionally neutral.



Figures 27
Parsippany: Interstate Development-1970
(information for diagrams collected from *U.S. Geological Survey: Morristown Sheet,* various years)



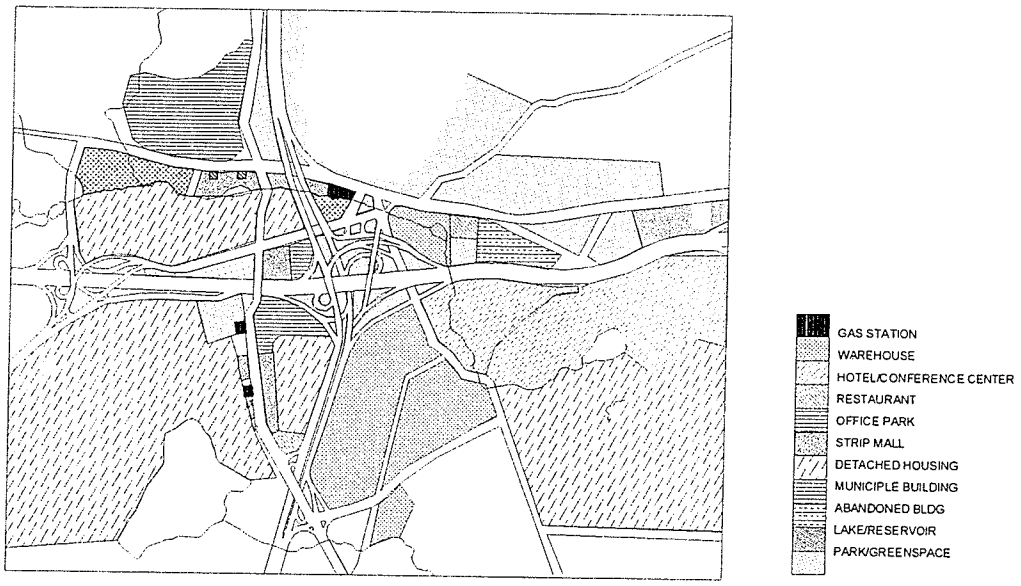
Figures 28
Parsippany: Interstate development -2002
(information for diagrams collected from *U.S. Geological Survey: Morristown Sheet,* various years)

29 PROGRAM

The cycles of use high help describe both the structure (highway) and the programs of Interstate City (Figure 24). The permanence of the organizing structure involves incredible capital investment and requires heavy earth moving and reshaping indicative of longer cycles of use.[57] The structural framework has a much longer life than that of the smaller units that it supports.[58] The linear organization of Interstate City and endlessly development incentives at underdeveloped counties facilitates high turnover of industries and promotes a transient workforce. Offices, once full of burgeoning communication companies, remain empty as the market continues to fall.[59] Restaurants, warehouses and offices close up or relocate to more a profitable interchange, cycling and recycling the programs of Interstate City.

The growth of large multinational companies has changed the perception of landscape and the program for land development. These industries are spelled out for us, the company logos of *Exxon, McDonald's* or *Super8* on big blue signs at each Interstate exit. They are the programmatic image of Interstate City. In the interest of profits and expedience, potential sites are selected based on their accessibility to the highway rather then qualities of their specific regions. Increasingly, industrial programs are relying on communication technologies for their economic success. Often, their locations are determined through market demographics. Product flow, GPS analysis of land use, and satellite photography help companies optimize their location of distribution warehouses, fast food restaurants and gas stations around the country.[60] Seemingly isolated outposts are actually part of a complex corporate strategy to nationally disseminate their product and image. Taken together, these multinational corporations form integral pieces of a greater city. Interstate City fosters a network of industries and services that are dependent on their relationship to the whole. Interstate City has created a community that shares a common main street and the desire to deliver in 3 days or less. Without an efficient means of ground transportation, these industries may never have evolved to their present form.

As interchanges become increasingly developed, the segments between are endlessly "filled" with parking lots, big box stores, conference centers, and corporate parks. The extensive length of the city makes it difficult (impossible) to see an end to its development.



Figures 29
Land Use 2002: Parsippany: I-80/I-287
(information for diagrams collected from *U.S. Geological Survey: Morristown Sheet,* various years)

The cold war paranoia that stimulated interest in the decentralization of American cities shaped its architecture as well. This paranoia influenced the image and location of many U.S. companies concerned with their physical and economic survival. In the first half of the 20th Century, a company's image was expressed in its architecture. However, as corporate headquarters began to relocate outside the traditional city, changes in the cultural and social climate affected their design. The standardized dictum of the Interstate network extends to influence its architecture. The idea of a nondescript, low-rise glass box provides a degree of anonymity in the landscape that many research and development companies seek in the interests of self-preservation. In plain view, it passes without raising any eyebrows. Architecture as a symbolic corporate image-maker is replaced with corporate sensibility, now a goal rather than an expeditious result. Many of the world's domain servers, the new mobile infrastructure, are located in office parks around the country, cloaked in the International Style.[61] They give no hint as to the program and power contained within their curtain walls. Companies and their secrets are holed up, just seconds from the Interstate, camouflaged by a landscape veil.

> *I stared at an entire screen full of these words and they dissolved and lost their meaning, the way words do when you repeat them over and over – the way anything loses meaning when context is removed – the way we can quickly enter the world of the immaterial using the simplest of devices, like multiplication*[62]

30 PERMANENCE

The road is essentially isolated from its built context. The continuity of built form lies not in the permanence of the architecture of Interstate City but in the highway itself. The imposing solidity of its structure is testimony to a City built to withstand all natural or man-made attacks. For nearly fifty years, the Interstate Highway has resisted the formal temptation to change with contemporary fashion.[63] It has pursued ambitious mobile goals and has managed to defy detractors as it methodically plots its path. It is this frame that transcends history, space and even culture rather than the transient programs that change with each generation.

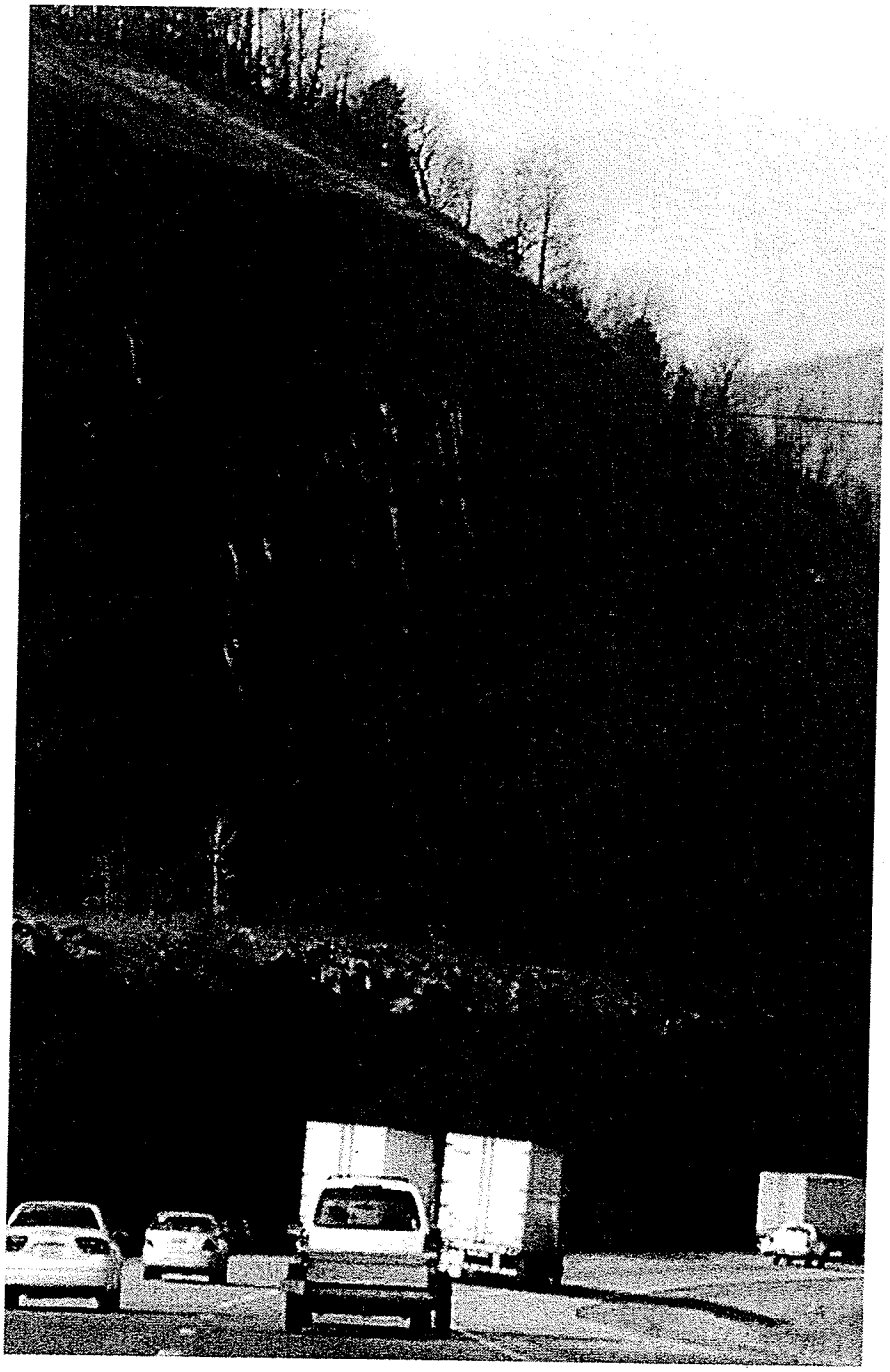


Figure 30
Mountain cut: I-80, Pocono Mountains, Pennsylvania

3.4 Erasure building the Highway

Good roads have an influence over physical impossibilities. By diminishing the natural impediments, they bring places and their inhabitants nearer to each other.

A.J. Dallas, *Cumberland Road.* (10th Cong., 1st sess. American State Papers, Volume; 21, Miscellaneous Vol. 2, Serial 038, 1816)

Interstate City is a new city. It passes over, under and through the landscape following the internal logic of mobility. Where necessary, it destroys the existing context to accommodate the spatial requirements of its form (Figure 30). While the old road was built to the shape of the land, Interstate City goes where it must to link points with the most direct route. Since construction began, the Interstate Highway has accumulated more than 10 million acres of right-of-way land in the United States.[64] It harnesses explosive technologies to accommodate the consistent push of automotive innovation and economic development. Interstate City builds by first erasing what came before, redefining regions, context and scale in the process.

31 THE SHAPE OF THE LAND

Written in 1816, this pre-automotive view of road building foreshadows the practice of erasure in Interstate City. Up until this point, road building had been an evolutionary process of reusing the foundations of existing roadbeds or simply following the contour of the land. The Split Log Drag, invented around 1904 by a Missouri farmer, was employed by farmers across the United States to improve local roads.[65] This simple technique of dragging a heavy log behind a team of horses or mules followed the shape of the land, over hills and down through valleys. As rural traffic increased however, there was a need for a more robust road.

The macadamized road, named after its Scottish inventor John Loudon Macadam, was used extensively in the late 19th Century. A 3-tiered stone surface comprised of a 12-inch large stone base, a 5-inch midsize stone middle layer, and a gravel topping[66] was compacted with heavy steam-powered rollers to lock the stones into place. The advantages of this new road were evident immediately. It drained water extremely well and its hardened top surface prevented carriage and bicycle wheels from getting stuck in the mud.

Man's battle with nature has been won. Whether we like it or not, we are now burdened with the administration of conquered territory.

Ove Arrup

Before standardized asphalt surfaces, the construction of the nation's roads was as disorganized as it was uneven. A scientific mandate for road building was adopted in 1893 with Austin Byrne's treatise on highway construction that advocated an approach similar to what had been taken with the railroad a half century earlier.[67] Within the Department of Agriculture, the Office of Road Inquiry was formed to research construction methodologies and to promote a national system of roads. With the support of the influential League of American Wheelman and the railroad companies, information about road building techniques was spread across the country. As more data was collected, the agency expanded into the Office of Public Roads and established a centralized database to collect and disperse information on optimum road-building methods.

Strict material and spatial requirements for Interstate construction made it impossible or unfeasible to renovate existing roads. Where the old road bent to the land, the new highway could be planned as the crow flies, 'diminishing' geographic and urban obstacles if necessary to apply its smooth surfaces. Even though technological advances in dynamite and earth shaping machinery existed before the Interstate, the ideological shift in road planning set by the requirements of the Interstate Highway Act of 1956 hastened their use. Just as the reaper changed the face of farming a century earlier, large-scale earth shaping equipment and dynamite would dramatically change the direction of the road.

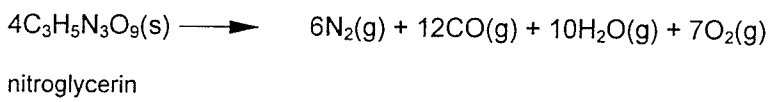


Figure 31
The standard dynamite used in the US is composed of nitroglycerin, ammonium nitrate, and sodium nitrate (2 other explosives), wood pulp (the absorbing medium), and a trace of calcium carbonate to neutralize traces of acids that might form during storage.

32 C3H5N3O9

Though best known for their work with synthetic fibers, the Dupont Company began as a munitions manufacturer. In 1861, they opened a plant in Gibbstown, New Jersey along what is now the I-295, south of Philadelphia.[68] By 1870, after Alfred Nobel had successfully stabilized Nitroglycerine (Figure 31) with a type of clay called *kieselguhr*, the company had begun producing dynamite.[69] What had previously been a highly volatile substance could now be safely packed into rods suitable for insertion into predrilled holes. The land could be easily erased to suit the will of the road.

Sideling Hill in western Maryland had been a transportation obstacle for centuries. The old U.S. Route 40 and the National Road before it followed the curve of the hill in a dangerous hairpin turn. In planning the Interstate Highway, a direct route through the mountain was selected. A mountain cut was deemed safer and cheaper to build and maintain than a tunnel of similar length. To connect I-79 in Fairmont, West Virginia with I-70 and I-81 in Hagerstown, Maryland, Holloway Construction Company of Wixon, Michigan blasted over 4.5 million cubic yards (equal to 10 million tons) of rock. Casehardened steel drill bits bore holes for the 5.22 million pounds of explosives that were used to carve the 340-foot deep cut. From the surface of I-68 to the top of the ridge, the structure of a mountain range 325 to 350 million years old is revealed. Composed of sedimentary rocks - conglomerate, sandstone, siltstone, mud rock, shale and a small amount of coal - the ridge was formed when the tectonic plates of North America and North Africa collided. It took less than 16 months to carve the mountain open.[70]

Figure 32
I-278: Bronx, New York
from *2002 GlobeXplorer, AirPhotoUSA*: published on www.mapquest.com

Figure 33
I-278: Brooklyn Heights, New York
In each of these instances, the road followed the path of least resistance, whether that resistance was geographic, economic or political.

33 CREATION

Interstate City does not try to integrate with the old city. As a new urban form, it exists apart from traditional settlement patterns and infrastructure. A highway, by definition, denotes a raised road above the existing ground. From within, context becomes self-referential as it focuses its energy and aesthetics on the problem of mobility. An aerial photograph of an urban center helps illustrate the artificial imposition of the highway in an urban setting. Interstate City begins as a graphic survey indiscriminately laid across the landscape. Topographical and geological boundaries are secondary to the direction and flow of the road. Interstate City destroys so it can build. It disrupts the status quo as history, community, and landscapes are all reshaped by the direction of the road. In its wake, Interstate City leaves new spaces that existing urban and rural landscapes address with varying results.

In rare instances Interstate City is land sensitive as with the I-278 in Brooklyn, New York where the highway terraces opposing lanes of traffic down the natural slope of a hill (Figure 33). It sweeps under the Brooklyn and Manhattan Bridges offering spectacular views of the city. At the base of the hill is the service road for the adjacent piers followed by two levels of opposing traffic and a pedestrian promenade on the top. Like Olmstead's park plans and Geddes' Futurama, traffic functions are carefully composed to allow each to move freely and independently of the other. In an urban setting, this integration of Interstate City with the existing city is an exception rather than the rule. Further north on I-278 is a more typical urban implementation.

In the late 1950s and 1960s, much of New York City was being "renewed" by Robert Moses in his attempt to modernize the city. In the Bronx, the Bruckner Expressway (Figure 32) cleared away historic centers and ripped out community gathering places to make room for the highway. Digging the expressway lasted months, violently blasting through the rock outcroppings that lay in its way. In the end, it left the community physically divided along an artificial line, the character and urban fabric of the Borough redefined by its edges. Mid-century renewal exemplifies the idea of erasure in Interstate City. It is representative of an idea of urban planning that valued the new and modern over the slow continuity of urban form.

Interstate City's commitment to the line has produced some unintentional consequences. "In spite of the calculation that goes into (its) planning - in fact, through its very rigidities – it is the one architecture that engineers the unpredictable."[71] While constructing a 260-km stretch of I-80 through the Platte River Valley of Nebraska in the 1960s, highway builders created a "Chain of Lakes" in accordance with plans worked out jointly by the State Game Commission, the state highway agency, and the Bureau of Public Roads (FHWA's predecessor). Contractors obtained sand and other fill material for the roadbed from low areas along the Platte River. Groundwater then rose to fill the "borrow pits" and formed more than 50 new lakes. The lakes are used for swimming, boating, fishing, and wildlife refuges. Called "an imaginative bonus" of I-80, the Chain of Lakes prompted one journalist to write in 1966: "There is a delightful but dangerous new malady...those doggone fisherman ringing their banks."[72]

34 SURFACE

Technological innovation has changed the way we move through the landscape in the last 100 years. From rubber seals in car doors to tubeless tires, automotive improvement has created hermetic shells isolating us from our environment. The surface between earth and tire however, has had the greatest impact on the way we move through Interstate City. Cars float on a bed of asphalt applied evenly enough to minimize cabin noise but gritty enough to provide adequate traction. This layer of aggregate and asphalt absorbs regional variations and vibrations. The land is excavated and compacted then leveled, filled, and compacted again to ensure a predictable ride. This increasingly refined plane suggests a new vision of the landscape, one that reduces regions to surfaces.

The original Interstate Highway called for concrete surfaces. 60% of the 47,744 mile U.S. Interstate Highway System was built of concrete, especially in urban areas where FHWA anticipated heavy traffic volumes. Concrete was selected because of its superior durability, higher reflection of light at night, and greater traction. As new technologies improved the wear and traction of asphalt surfaces, concrete road construction declined. Today, 96% of all paved roads in the U.S. are asphalt[73] including the majority of highways in Interstate City (Figure 7). Hot Mix Asphalt (HMA) is composed of approximately 95% aggregate and 5% asphalt binder that are mixed together and heated. While the asphalt for early pavement was mined from natural asphalt lakes,[74] almost all asphalt used

today is refined from crude oils. After everything of value is removed, the leftovers (hydrogen and carbon with smaller proportions of nitrogen, sulfur, and oxygen) are made into asphalt cement (the binder) for pavement.[75] One of asphalt's greatest benefits is that it is recyclable: nearly "100,000,000 tons of asphalt is removed each year during pavement reconstruction and 80 percent, or 80,000,000 tons are recycled. No other U.S. industry recycles more of its own product."[76]

Asphalt highways are designed with a maximum 100-year structural life span, with periodic resurfacing every 15 to 20 years. The New Jersey Department of Transportation found that the original structure of a 26-year-old, 10-inch thick patch of asphalt on the I-287 has remained intact. In addition, the New Jersey Turnpike is over 50 years old and shows no signs of structural failure. A new [illegible] was all that was required to maintain the integrity of the entire highway.[77]

35 PROCESS

The process of building the Interstate Highway is, in effect, a factory turned inside out. Rather than assembling a product that travels along a sequential line, highway building requires that the assembly line be the object in motion. The idea of a line moving relative to a stationary product can be seen in modern skyscraper construction, starting with the Empire State Building. The building was in essence a factory that produced a building within itself. As materials were delivered to the site, a highly coordinated system of supply brought them to their appropriate location. The workers moved about bolting and welding component parts floor by floor. The building took shape as it inched closer to its final height of 750 feet. Interstate building follows these principles of automation and assembly but rotates the process along a horizontal plane. Highly volatile machinery is carefully sequenced to ensure an uninterrupted production process.[78] The National Asphalt Paving Association describes the procedure as follows:

> *A milling machine is typically used to remove the surface material from an existing roadway. That material is loaded into a truck and carried back to the plant for recycling. A brooming machine then comes to clean the surface, followed by a distributor truck, which puts down the tack coat that helps glue the new pavement to the existing surface. A truck carrying HMA paving material from the plant backs up to the paver and dumps the material into the hopper or material transfer device, or places the material in windrow so that it may be picked up and put into a paver. The paver lays a smooth mat. Then a series of compactors comes after the paver to densify the material. These compactors may include vibratory or static steel wheel rollers or rubber tire rollers.*[79]

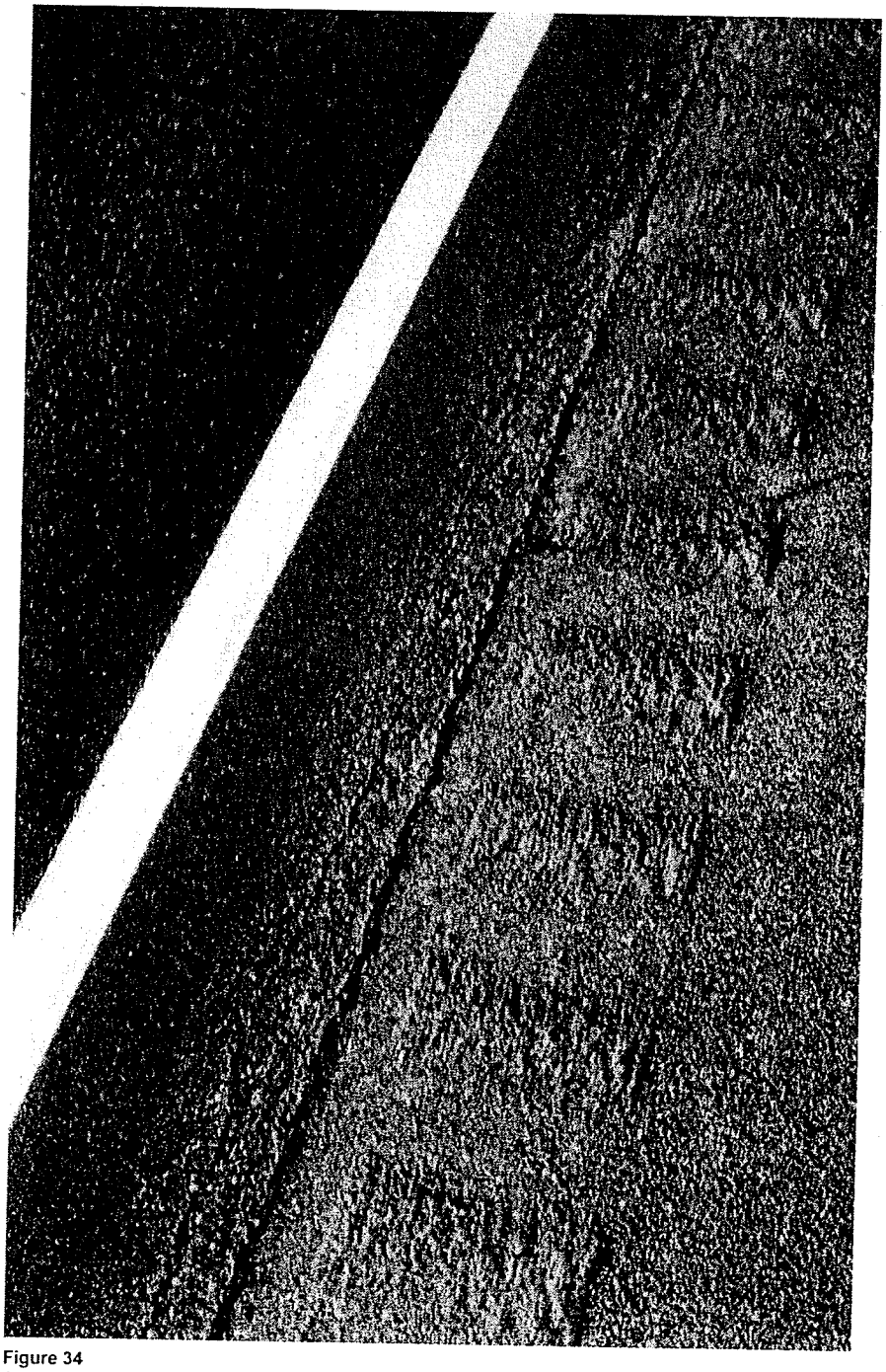


Figure 34
Asphalt detail I-80 Parsippany, NJ
Subtle details like the vibration grooves cut in the shoulder, or the chemical composition of the asphalt surface, begin to describe a regional approach to highway building not evident in the blasting of mountains.

> *Freeways should have a minimum of two through-traffic lanes for each direction of travel. Through-traffic lanes should be at least 12 ft. wide. Pavements should have a high-type surface with adequate skid resistance and provide a high degree of structural adequacy. Cross slopes should range between 1.5 and 2 percent on tangent sections consisting of two lanes in each direction with a crown at the centerline of the pavement. The higher value is recommended for areas of moderate rainfall. For areas of heavy rainfall a cross slope of 2.5 percent may be necessary to provide adequate pavement drainage...For elevated freeways on viaducts, two-lane pavements usually are sloped to drain the full width of the roadway. On wider facilities, particularly in areas of heavy rainfall, surface drainage may be two ways on each traveled way so that snow stored in the median will not melt and drain across the traveled way, or the median should be designed to prevent this occurrence.*[80]

What then can be made of the changes to land engagement within Interstate City? Technological advances have helped create a domineering view of the land rather than one of symbiosis and stewardship. The subtlety of landscape and region evident in the road that follows the river valley or the shape of the hill is less evident in the vector-based planning of Interstate City. Perhaps a place theory for Interstate City is to be found below the surface, hidden in its chemical composition. Rainfall, soil types, climate, and traffic volume constitute the regional variables that the highway surface synthesizes in its mix. The composition of aggregate and asphalt binder is site specific, engineered to suite different climactic and regional conditions. In areas with high rainfall amounts for example, an open-graded pavement is used to allow water to drain through it to prevent hydroplaning and spray (this type of surface also proves to be quieter in urban areas).[81] While Interstate City may appear standardized on the surface, it does, in fact, vary according to site (Figure 34).

Every morning the local news broadcasts the weather and traffic conditions of the Interstate Highways. A big snow storm has the power to disrupt this engineered city, though today we fear the immobility that it can create rather than the physical danger of the storm itself. As it approaches gridlock paranoia increases. Even with the plows on standby and salt trucks spinning ahead of the storm, Interstate City is reduced in size from 4 to 3 lanes. Snow pushed to the inside lane constrains the flow. The remaining lanes must accommodate an increase of as much as 12,000 cars per lane per hour until all the snow can be cleared. When a little snow can cause such a crisis, the erasure of natural impediments and the smoothing of the land seem like impractical attempts at environmental control.

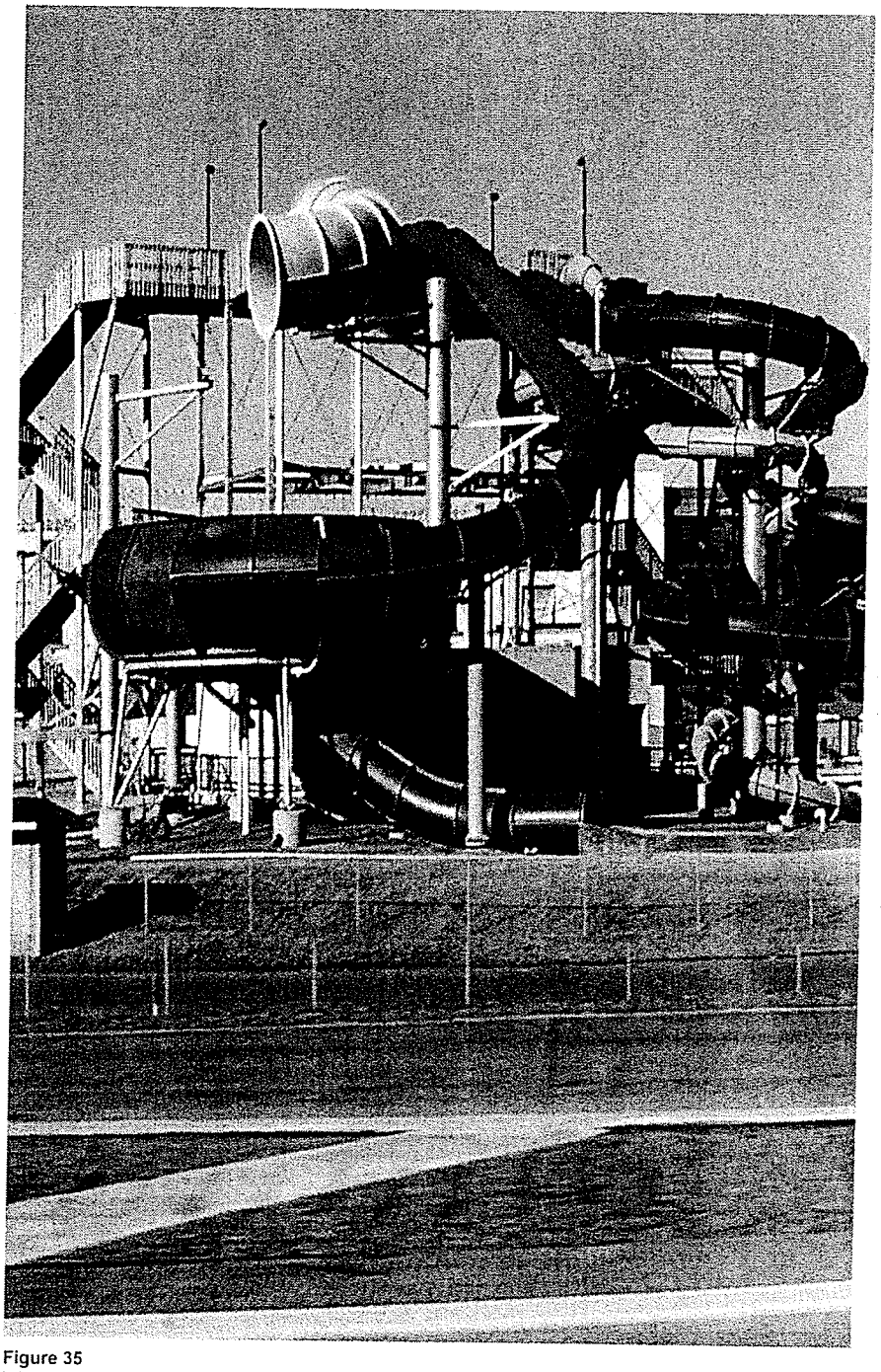


Figure 35
Waterslide park; I-90, Wisconsin

3.5 Introversion from landscapes to dashboards

A waterslide park off the I-80 in Wisconsin is an appropriate analogy to the highway itself (Figure 35). As a closed, linear transportation infrastructure, it operates on the flows and cycles of users within an inwardly focused environment. The pattern of the tubes describes the potential energy of the line that is engaged as one passes through it. The tube filters out context much the same way the automobile and the highway separate the driver from the landscape. Smoother roads, greater speeds, automotive refinement and new communication technologies have shifted the experience of the open road inward. From a sealed interior, *seeing* the road is more important than anything else. Concurrently, the linear structure of Interstate City only further emphasizes this tendency to concentrate highway experience to the interior. In the end, the shift in focus from landscape to dashboard redefines the mobile experience and particularly how we define public space.

37 ARCHITECTURE/INFRASTRUCTURE

Within the confinement of the highway is an interesting spatial paradox. While expanding its linear geographical boundaries, Interstate City is inversely contracting the life along a 400' wide strip. It sets up physical boundaries to further isolate the road from its landscape and context. Fences, ditches, guardrails and roadside plantings help keep industry, housing and commerce firmly separated from the highway proper (Appendix A.8). The link between the street and architecture no longer exists as it did along Main Street or even the L.A. Strip where the car had a direct relation with commercial development. [82] Instead they are isolated from one and other through a series of ramps, access and feeder roads all servicing the Interstate. As described by Banham, "a domestic or social journey in Los Angeles does not end so much at the door of one's destination as at the off-ramp of the freeway, the mile or two of ground-level streets counts as no more than the front drive of the house."[83]

Figure 36
Interior 2002 Ford Focus door panel

The relationship of car interior to highway surface refinement reflects a change in mobile experience. Whether it is smoother roads that push manufacturers toward greater interior refinements or automotive technology that demands better surfaces is not important. Historically, the relationship of rubber to asphalt has been evolving to limit the effects of the natural environment on the driver. The vulcanization of rubber in 19th Century Williamsburg, Brooklyn marked a huge leap in evening out the ride. While tires continue to improve, automobile designers look to the minutia to reduce the impact of mobility. North of Detroit, Michigan in Shelby Township (off the I-75), *Armes, Inc* designs and manufactures almost all the rubber and polystyrene soundproofing products for the automotive industry.[84] By strategically inserting thin strips of die-cut foam into hollow steel cavities, the interior noise rating of a car can be reduced by over six decibels. The roar of the open road is no longer desirable – the soundproof car interior is now the goal.[85]

From the inside of the automobile, "the surrounding landscape unfolds like a televised screen."[86] With the windows up and the radio on, the Interstate is reduced to an exclusively visual experience. The car is the 'capsule', its interior a stationary recliner from which the scenery passes by the windshield. It suggests a passive engagement of body to landscape through the framed view. But "the eidetic image of place is bound into a greater phenomenal range of significance than vision or contemplation affords."[87] The view stands "only as a historical sign, a mere picture, while the experience of land moves from engagement and change to mere voyeurism.[88]

In January 2002, the latest in driving simulator technology facilities opened in Coralville, Iowa, just a few miles past the I-380 interchange on the I-80. The Human Factors Laboratory at the National Advanced Driving Simulator tests drivers' reactions to real world driving conditions in a controlled environment. Inside the pod is a modified Chevy Malibu. Its wheels have been replaced with 6 computer controlled hydraulic mounts that simulate various terrain conditions. Sophisticated software takes the place of a fuel-burning engine, recreating subtle sounds and vibrations of motion. The strength of the simulator however, is its ability to create virtual worlds beyond the windscreen. High-resolution images are projected onto the surface of the pod's domed ceiling. The system software produces a range of driving scenarios across a 360-degree field of vision that

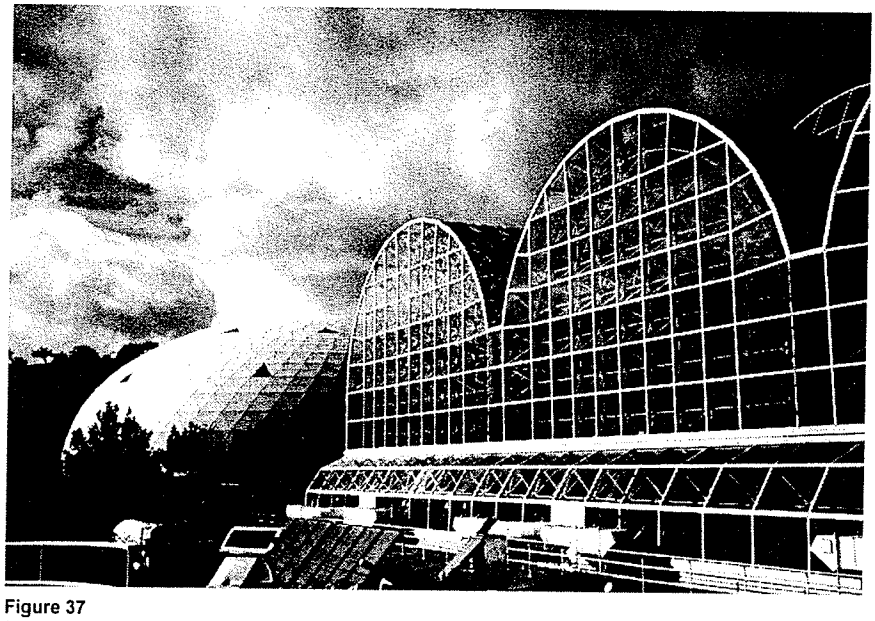


Figure 37
Biosphere 2

immerses the driver into a virtual world. Variable times of day and the weather conditions can be adjusted to test drivers' response to a given situation. The cameras change the scenery based on the position of the 'car' relative to it. One of the most important findings of the simulator is that driving is a 90 percent visual task.[89]

Most consider the endless paved surfaces of Interstate City that Kevin Lynch sought to aesthetically enhance monotonous and uninteresting. As Lynch remarked in the late 1960s, it is "only the speed, scale, and grace of his movement [that] can compensate" for the limitations of a visually dominant experience.[90] However, the possibility of space and motion, light and texture on the driving experience could not overcome the enormity of its scale. As culture accelerates, it is difficult to see "how the city is organized, what it symbolizes, how people use it, how it relates to them."[91] The spaces of Interstate City cannot hold our flittering attention. We seek excitement and distraction to help pass the hours on the road. When it is not found in exterior forms, the focus turns inward, not only away from the perceived ugliness of the highway, but toward interior diversions that the experience of motion and space no longer provide. The exhilaration of sweeping overpasses of the 1960s has become common in Interstate City today.

In Interstate City, you can 'live' comfortably in processed air environments 24 hours a day. From the New England ranch bungalow community, to the attached garage, into the SUV, down the highway and into the office park, a regulated 72 degrees keeps the natural climate under control. All this is made possible through the miracle of *Freon*.[92] In the context of settlement and community, *Biosphere 2* might be an apt comparison with the introverted tendency of the car and Interstate City (Figure 37). Mechanically dependent, it too seeks to recreate or simulate nature in a sealed, pod-like environment. It represents a similar view that nature can be harnessed, engineered and controlled. Elaborate ventilation and irrigation systems help create (with limited success) a city under glass that can sustain itself indefinitely. The automobile has similarly become self-sustaining. In 1955, the Federal Civil Defense Administration released this notice in the event of a nuclear attack: "[T]he car provides a small, moveable house. You can get away in it – then live, eat, and sleep in it in almost any climactic conditions, if necessary, until a civil defense emergency is ended."[93]

Speed reduces the visual field, restricts peripheral vision, and limits the time available to receive and process information. Highways built to high design standards help compensate for these limitations by simplifying control and guidance activities, by aiding drivers with appropriate information, by placing this information within the cone of clear vision, by elimination much of the need for peripheral vision, and by simplifying the decisions required and spacing them further apart to decrease information-processing demands.[94]

Excerpt from A Policy on Geometric Design of Highways and Streets (1990)

39 PUBLIC SPACE

The increasing introversion of mobility has altered the formal constitution of Interstate City. If the shopping mall can be said to have privatized public space then Interstate City has all but dissolved the traditional definition of it. The toll plaza (Figure 38) and the rest area (Figure 39) are the City's equivalent to the town square. But though they are interesting places in their own right, they lack the spontaneity, diversity and accessibility of traditional public space.

Beyond the mundane formal task of transporting people, the street has a secondary life as an unofficial public space. Before the automobile, streets were filled with vendors, markets, and children, who, through their actions, transformed the pavement into an informal gathering place teaming with life. During the late 19th and early 20th century, as traffic increased, many rapidly growing cities built broad boulevards like the Eastern Parkway in Brooklyn, New York to beautify their communities, open up new neighborhoods for development and provide better access to major parks and cultural institutions. The boulevards were constructed at grade level, lined by broad tree-shaded sidewalks for pedestrians and trimmed with handsome landscaping. Interstate City however, makes no such provisions. Typically, trees planted along the highway are regional foreign plants that soak up the excess water run-off created by the road surface.[95]

But though the City turns a blind eye to the pedestrian it manages in other ways to regain some of the historic flair of the informal street. When traffic slows at a toll *plaza* on a holiday weekend, enterprising young vendors sell car door to car door bottled water, juices, melons, dolls, ice and almost anything else imaginable.[96] This diversity within the public space is exemplified by its citizenry as well - Volvos, Saabs, Mercedes, Fords, Mazdas, GMs, Subarus, Infinities, Hyundais, KIAs, and BMWs all participate in this community.

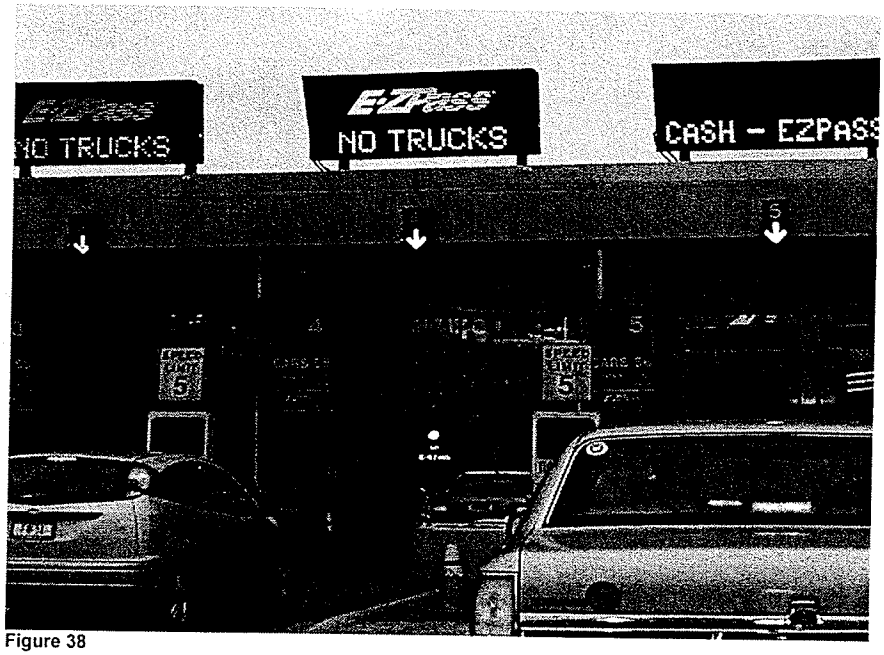


Figure 38
Toll Plaza
In Interstate City, 'plazas' are places to slow down and to interact with a governing authority to pay the user fee. Traffic carefully spreads across the plaza into neatly formed lines.

Figure 39
Rest Area
Interstate City's rest stops are little dioramas of American life. They are places to eat, sleep, refuel and pee. They stock all the services and amenities that one would need but tailors them to suite the needs of a temporary place. After all, the rest stop is the temporary, public space of Interstate City.

The shift from open road to sealed car and the reverence for automobile transportation sealed the fate of the pedestrian in Interstate City. You can sometimes catch a glimpse of someone walking outside the City high above the roadway. In *Habitrail*-like tubes, chain link enclosures safely cross Interstate City, clearly separating pedestrians from highway and machine. These tubes are however, little more than weak gestures to a walking public that have no place in the City. In Interstate City, the flaneur drives a beige sedan down the middle lane at 65 mph.

40 ANONYMOUS

The ability to move effortlessly across the country as individuals has become as much a constitutional right as the freedom of speech. There is the sense that the driver's seat is in fact the very seat of freedom. This stems from the relative autonomy offered by the road.

> *By now he had ditched his dirty black pickup and rented a generic maroon Chevrolet Corsica, of which there were no fewer than half a million on the highways of South Florida during tourist season. Twilly enjoyed feeling inconspicuous behind the wheel; for the sake of appearances, he even spread a road map upside down across his lap.*[97]

In the fall of 2002, the *Beltway Snipers* of I-395 in Maryland took advantage of the accessibility of the highway, its relative freedom from surveillance, and the generic styling of their car to elude capture. Thirteen random attacks were carried out with a high-powered rifle shot from a hole in the trunk of a blue Cutlass Supreme and terrified a nation for over two weeks.

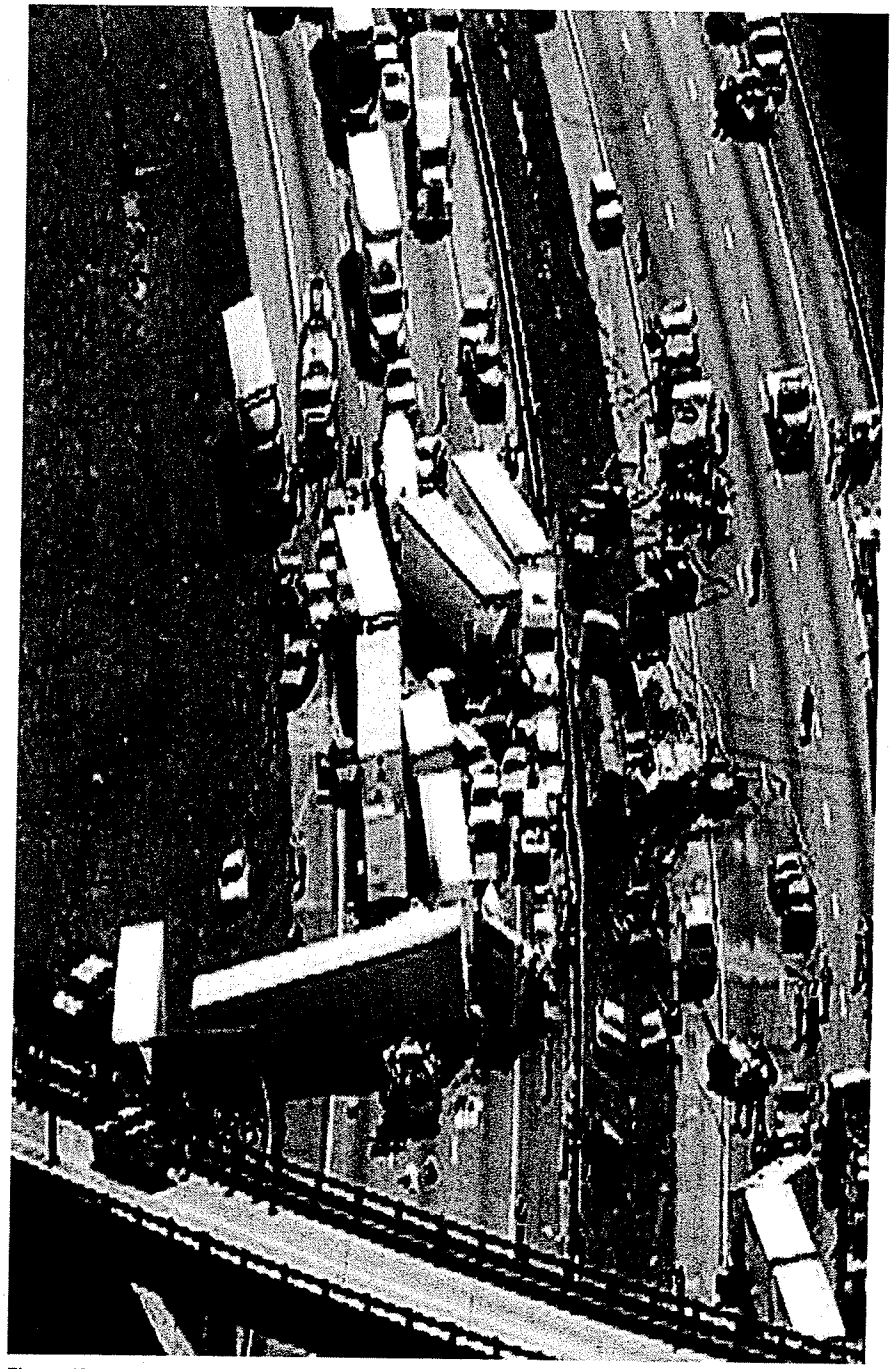


Figure 40
Pile-up

4

Outlook prospects for the future

The fragility of Interstate City is most visible when it breaks down. One closed lane, a stalled car, a distracted driver, or a slippery road surface can destroy the illusion of a perfect mobile city. With each chain reaction pile-up, the end of the great mechanical city of the 20th Century draws nearer. But is this the end or only the beginning of a new shift in Interstate City? There is evidence of the latter as many of the tenets that helped define it in the first place are being reevaluated and dismissed altogether. Namely, increasing environmental and contextual awareness and emerging digital technologies are beginning to reshape the City. This final chapter looks at these emerging shifts and their possible effects on the future of Interstate City.

41 CONTEXT RECONSIDERED

> *A highway necessarily has wide-ranging effects beyond that of providing traffic service to users. It is essential that the highway be considered as an element of the total environment. Environment as used herein refers to the totality of man's surroundings: social, physical, natural, and manmade. It includes human, plant, and animal communities and the forces that act on all three. The highway can and should be located and designed to compliment its environment and serve as a catalyst to environmental improvement.*
>
> AASHTO. *A Policy on Geometric Design of Highways and Streets (1990)*,p114.

It is hard to imagine another Robert Moses building freeways indiscriminately across the country. While there has been a constant voice of opposition to Interstate City over the last 50 years, it has managed to maintain its direction and purpose independent of rural and urban contexts. Even though the *Green Book* (see above) has long advocated a more holistic approach to road building, Interstate City has made only token gestures. It has built a-spatially, implementing a Federal mandate across the country, seemingly blind to regional variations. But increased environmental and urban contextual awareness may potentially reshape the planning of Interstate City. It can no longer exist

independent of its surroundings. In Boston for example, the burying of 8 miles of the I-95 through downtown, (known locally as the Big Dig) is an effort to reclaim the urban fabric that the elevated highway destroyed. In addition to removing the Central Artery, the $11 billion project will add extensive parks and open space to the city.[98] In Brooklyn, there is talk of covering a stretch of the sunken Gowanus Expressway (I-278) to reconnect neighboring Sunset Park and Red Hook. Further north on the Brooklyn-Queens Expressway (I-278) in Williamsburg, a new elevated concrete interchange with contoured sculptural pylons and curving concrete beams creates both invigorating and human spaces beneath it. On the highway, the differences are imperceptible as the design maintains the speeds and continuity of movement that helped define Interstate City in the first place.

In addition to a greater urban awareness, the future of Interstate City will be shaped by an environmental sensitivity to challenge the practice of Erasure (Chapter 3.4) in highway construction. The exertion of man's dominance over nature in infrastructure planning will give way to renewed stewardship of the land. After all, the imposing solidity of many of the forms of Interstate City may not be as eternal as the structures suggest. The 1989 San Francisco earthquake that destroyed the Embarcadero Freeway literally (and violently) questioned the life cycle of the highway (Chapter 3.3). It was a sudden and powerful reminder of the precariousness of building against natural laws.[99]

42 DECENTRALIZATION

After the attacks on New York City's World Trade Centre in 2001, the idea of decentralization resurfaced. The vulnerability of the concentrated urban center that paranoid planners had forecast half a century ago became all too real. Many companies instinctively relocated to New Jersey or Connecticut office parks. The spatial constitution of Interstate City makes it a safe haven, a place where corporations can quietly and peacefully blend into the landscape. As long as there is an imminent fear of attack, Interstate City will continue to thrive.

43 INFRASTRUCTURE (NEW)

Corresponding approximately with the 1996 completion of the Interstate Highway System was the explosion of electronic connectivity. The ideas of acceleration, erasure, mutability, and introversion all stand to be affected by emerging digital technologies. Like other areas of contemporary life, the future of Interstate City and the experience of mobility are directly tied to the appropriation of electronic communication within the mechanical context. At the same time the Interstate Highway Act was seeking support in Washington, the issues of communication and highway infrastructure were being raised:

> *Our unity as a nation is sustained by free communication of thought and by easy transportation of people and goods. The ceaseless flow of information throughout the republic is matched by individual and commercial movement over a vast system of interconnected highways crisscrossing the country and joining at our national borders with friendly neighbors to the north and south.*
>
> *Together, the united forces of our communication and transportation systems are dynamic elements in the very name we bear - United States. Without them, we would be a mere alliance of many separate parts.*[100]

Eisenhower could never have known how prophetic his words would be.

Embedded in its asphalt, floating 19 miles above, or located in a remote traffic-monitoring room complete with banks of live video feed, Interstate City is being infused with digital architectures that supplement its function but remain hidden from view.[101] These new infrastructures piggybacking the Interstate Highway are as diverse as the programs that the road has attracted in the past. From government agencies to multinational corporations, American industry is finding new ways to use the architecture of the Interstate to suite their own needs. Historically the companies lured to Interstate City had a quantifiable commodity (goods or services) intrinsically tied to the economics of the highway. The new Interstate industry is reliant on these same businesses. It depends on the collection of information regarding our highway usage patterns. This information has in turn become a new currency.

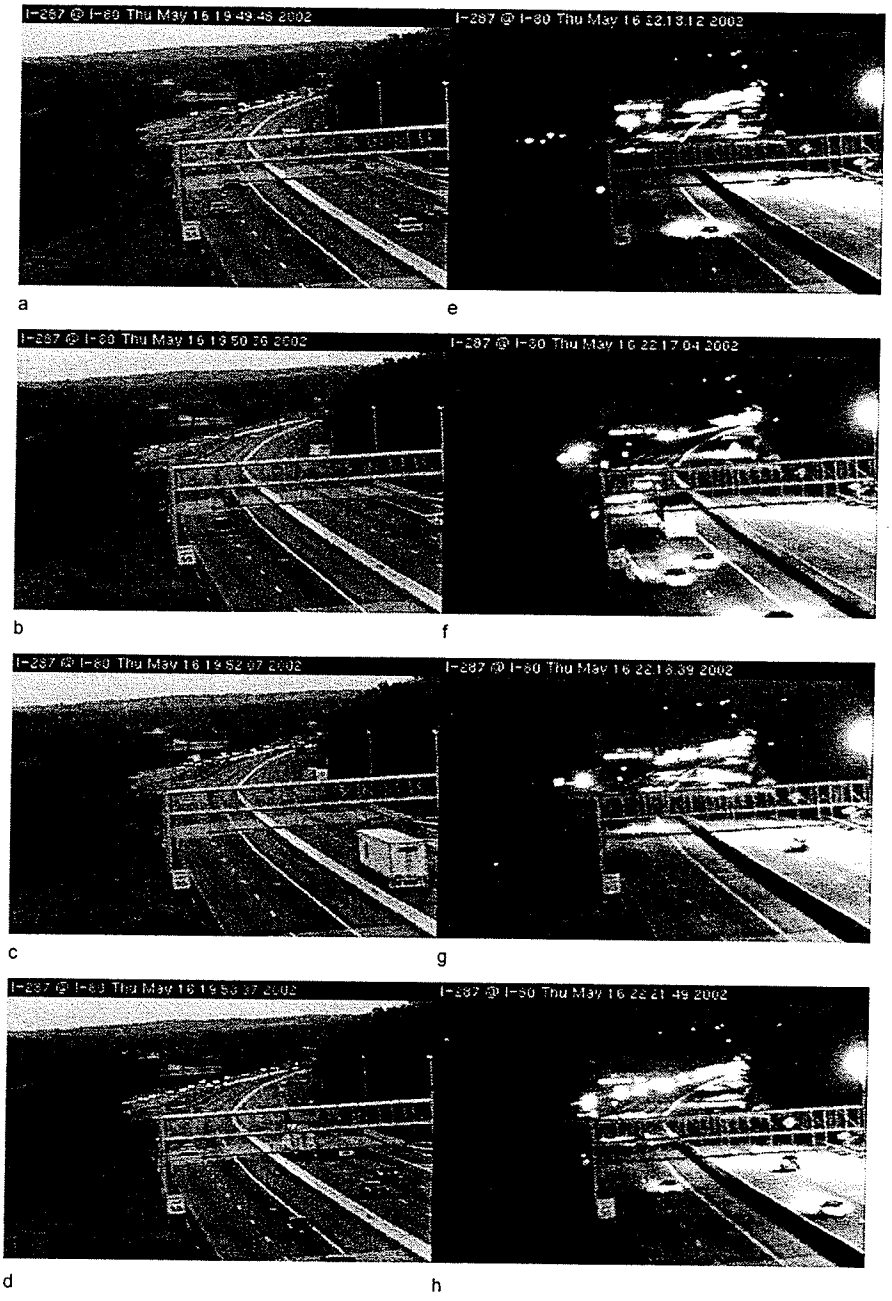


Figure 41
A camera mounted on a steel post on the I-287 overpass in Parsippany takes photos every 5 seconds to publish on the Internet.
www.newyork.metrocommute.com/cgi-bin/metro/video/NJ/video102html

In Elwood Park, NJ (off the Garden State Parkway and the I-80) is the New Jersey Department of Transportation's (NJDOT) Traffic Operations Center North. Recently, the NJDOT activated the $45 million "MAGIC" intelligent transportation system along I-80 and other North Jersey roadways.[102] The Metropolitan Area Guidance Information and Control system use radar, pavement sensors, fiber-optic cabling, and closed circuit cameras to relay information back to LED signs at the side of the highway regarding accidents, hazards and the best alternative routes. From this centralized command post, your mobility is being watched. This information is also available online:

> *Get the power of Metrocommute reports for your commute (car, bus or train) where you need them and when you need them -- right on your pager, cell phone, or PDA! Just tell us the name of the road, bridge, tunnel or transit line, and the times you want your reports. Metrocommute's e-Alerttm system will automatically send personalized reports to your wireless device![103]*

But benevolent information gathering can easily give way to panoptic tracking. Interstate City data is invisibly fed to remote locations and divergent agencies around the nation, the Interstate Explorer reduced to a statistic. New technologies are allowing these companies to access more than just your shopping patterns - they can now monitor your physical mobility. It is this mobile information that tells researchers how far you travel each day, what exits you take, where you buy your gas, and how much you pay in tolls. At first, it was the invisible hand of the U.S. military and the automotive manufacturers controlling the Interstate System but today these marketing firms have the potential to assume control of the network.[104] They create profiles so that credit card companies, for example, can more accurately target potential clients. Your profile can be legally sold to advertising brokers without your knowledge or permission, revealing a piece of who you are and where you have been.[105] When our mobile information is collected and distributed in this way, the freedom and anonymity that the road once promised begins to erode.

44 VIEW (PART 2)

New digital technologies have the potential to reconstruct a dimension of landscapes that cannot be seen at full speed. Built-in sensors will expand the driver's view, adding greater depth to the driving experience and reintegrating the highway with the land. Already, the 2003 *Cadillac Deville DTS* and *DHS* have adapted US Army heat-sensing technology (night vision) for practical commercial

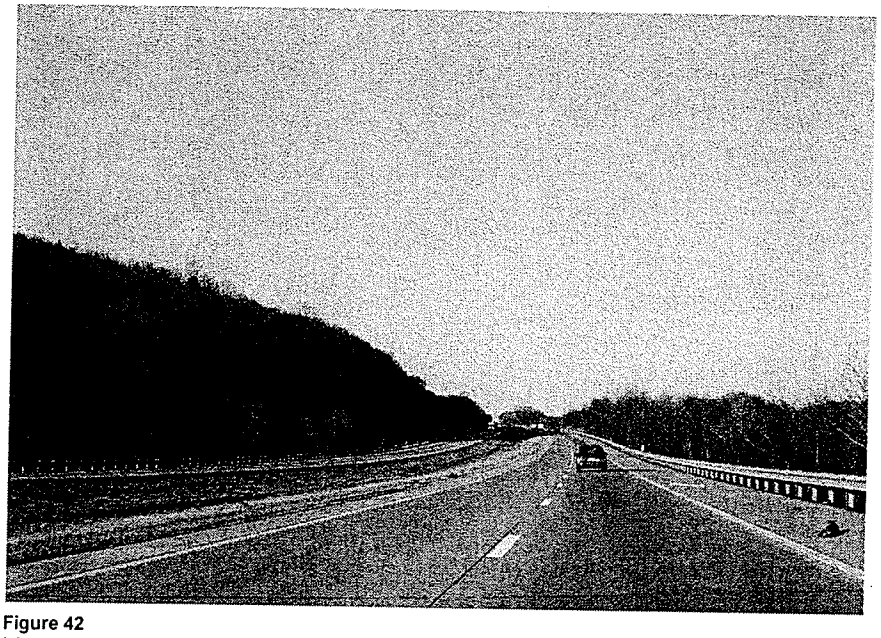


Figure 42
I-80

use. An infrared sensor 'sees' up to five times farther down the road than the low-beam headlights allow. It captures the heat signatures of objects on the road and runs this information through a signal-processing unit before displaying the scene on the windshield.[106] At Columbia University, ideas about spatial perception are being even more radically challenged. The *Mobile Augmented Reality System* (MARS) is taking the first steps toward synthesizing digital information with movement. Augmented reality supplies information via computer-generated text, graphics, and 3-D animation and superimposes it on real world images. In controlled digital/physical landscapes, the user is outfitted with a laptop, GPS equipment, headgear, and glasses with a small transparent display. Looking through the filter of the lens, the landscape is overlaid with facts specific to the objects in view. Historic battle sites, former residences of famous people, or the significance of a certain flag: all of history is revealed in real time. This new technology may revolutionize how we move through and learn about the world. Now, imagine the lens graphed onto a windshield. These digital filters have the potential to rewrite the perception-mobility relationship within Interstate City.

45 ARCHEOLOGY

Like the rail lines that lay beneath so many roads, is Interstate City destined to become a concrete and asphalt memory that the land takes back? It *will* happen when a new mobile discovery makes travel easier and more expeditious. Imagine, many years from now, an archeologist discovering these strange markings across the landscape: strangely spiraling intersections and endless stretches of asphalt. Perhaps with some critical historic distance, these forms may one day be appreciated as a unique form of human settlement.

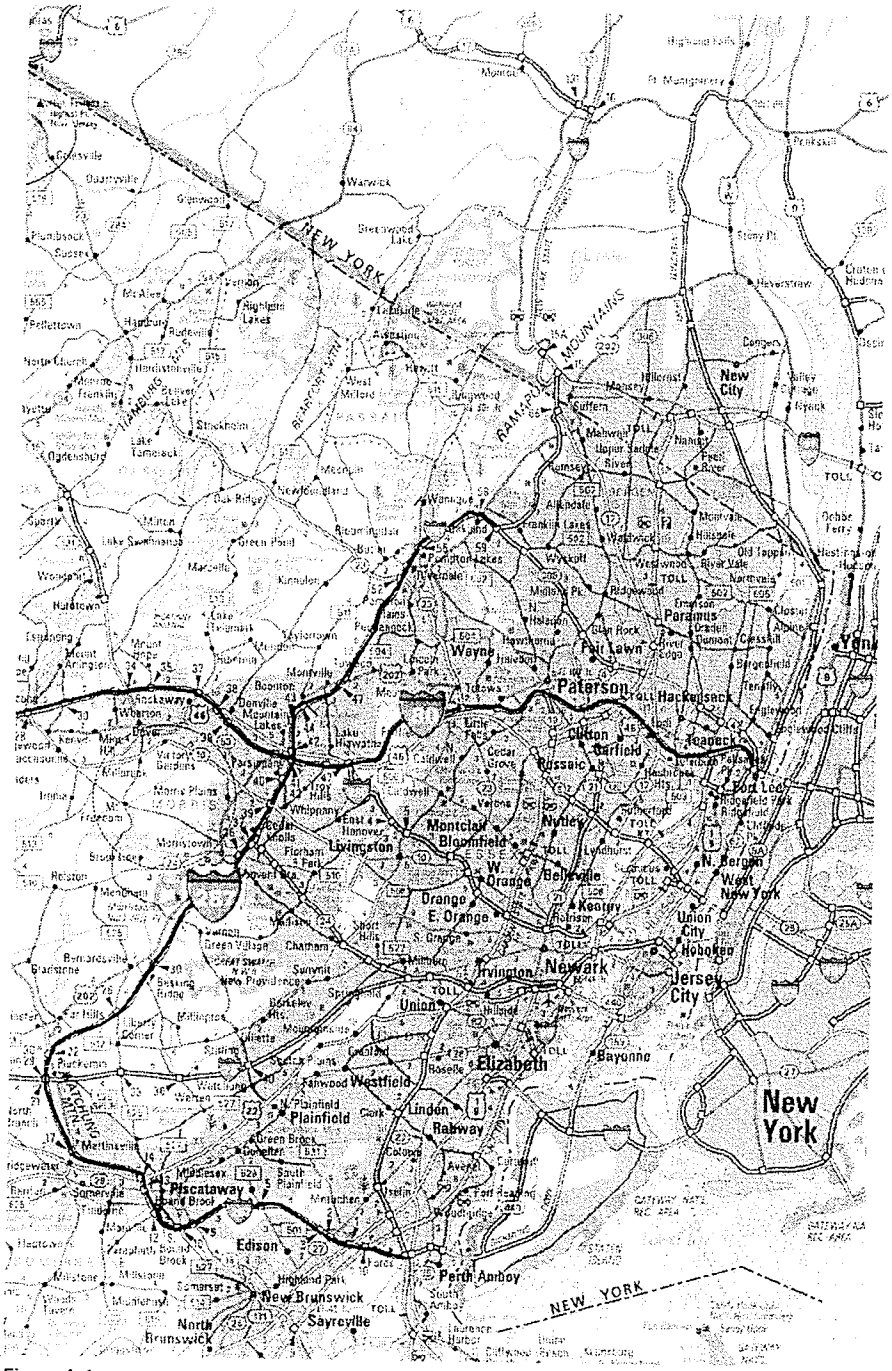


Figure A-1
New Jersey
from Rand McNally Road Atlas 2000- Millennium Edition, map 66.
(Emphasis added)

A

Appendix *case study*

A.1 EXIT

The first warnings of the upcoming exit appear on a galvanized piece of steel high above the roadway, white painted letters on a bright green field. Everyone is in a rush (as always) tonight, anxious to get off the highway and into his familiar neighborhood. Fortunately, traffic is moving swiftly- the construction finally complete in the outer two lanes. Ten lanes of traffic moving 2,000 cars per lane per hour, most of which are retreating from the city. Less than a car length separates one from the next as speeds approach seventy miles an hour. I speak: "Dial home". Automatically, my Motorola dials the preprogrammed number and I leave a message that I will be home shortly. Suddenly, traffic slows and I look up to notice an LED sign at the side of the highway indicating that there will be upcoming delays due to a stalled car. The effects reverberate through traffic to reach my current position. As daylight dims, the clouds roll over and bring light rain. The road lights up, one car after another with oncoming headlights. To the right is a salmon colored concrete wall, 20 feet high, desperately trying to separate the highway from whatever may be on the other side. But through the cracks, the din of fast food restaurants, motels, gas stations and big box stores vie for passing consumer attention. As my exit approaches, I veer out of the express lane to the far right, narrowly avoiding a new Volkswagen in the process. I am momentarily trapped between two semi trailers but squeeze through to make my escape.

A.2 FACTS

I-80/I-287 Interchange

Area:	4,021,317 sq.ft.92 acres.
N-S length:	0.5 miles
E-W length:	0.7 miles
Width (avg.):	10 lanes (both directions)

Parsippany-Troy Hills

Founded:	1928
Population:	50,649
Elevation:	+300'-0"
Latitude:	40°N
Longitude:	74°25'30"
Area:	25 square miles
Highways:	I-80, I-287, I-280, US 40, US 202
Industry:	1800- ironmongery/farming
	1950- farming
	2003- technology/business

I-80

Eastern terminus:	I-95 Interchange (Fort Lee, NJ)
Western terminus:	San Francisco, CA
Length:	3,025 miles
Number of States:	11
Major Cities:	Cleveland, Chicago, Des Moines, Omaha, Cheyenne, Salt Lake City, Reno, San Francisco

I-287

Northern terminus:	I-95 Interchange (Rye, NY)
Southern terminus:	I-87 (Fords, NJ)
Number of States:	2
Description:	I-87 spur road around NYC metro area

Figure A-2
Aerial view I-80/I-287 Interchange
from 2002 GlobeXplorer, Air PhotoUSA

A.3 I-80/I-287

The I-80 / I-287 interchange is at the geographical center of the Parsippany-Troy Hills Township, 28 miles west of New York City. Officially founded in 1928, the township incorporated as a series of smaller summer communities because none were large enough to incorporate on their own.[107] Today, the communities sprawl into each other, their new borders being the Interstate highways. Before the highway it was the area's rivers, lakes and more temperate climate that attracted people from the urban coast. In its early history, Parsippany-Troy Hills had remained relatively isolated as the railroads avoided it, passing through Boonton to the north and Morristown to the south. The area's popularity as a summer retreat grew when the regional rail line finally reached the area in the early 20th Century. Today, modern office campuses, corporate conventions centers and distribution hubs occupy the agrarian pastures of 40 years ago.[108] The construction of the Interstates in the 1960's contributed to the doubling of the township's population to over 50,000, making it the largest 'town' in the County.

I-80 is a continental Interstate that covers over 3,000 miles, linking New York and San Francisco. I-287 is the ring road that diverts north-south traffic from I-87 around the metro New York area.[109] Each Interstate is heavily traveled, the I-80 carrying over 2,000 cars per lane per hour during peak intervals. East of I-287, I-80 widens to ten lanes in a 2-3-3-2 configuration between EXIT 43 and EXIT 47 (Parsippany-Troy Hills). This section carries approximately 120,000 vehicles per day. Today, I-80 through traffic occupies the inner roadways as the outer roadways are used for traffic to and from I-287. The speed limit on this section of I-80 is 65 MPH.

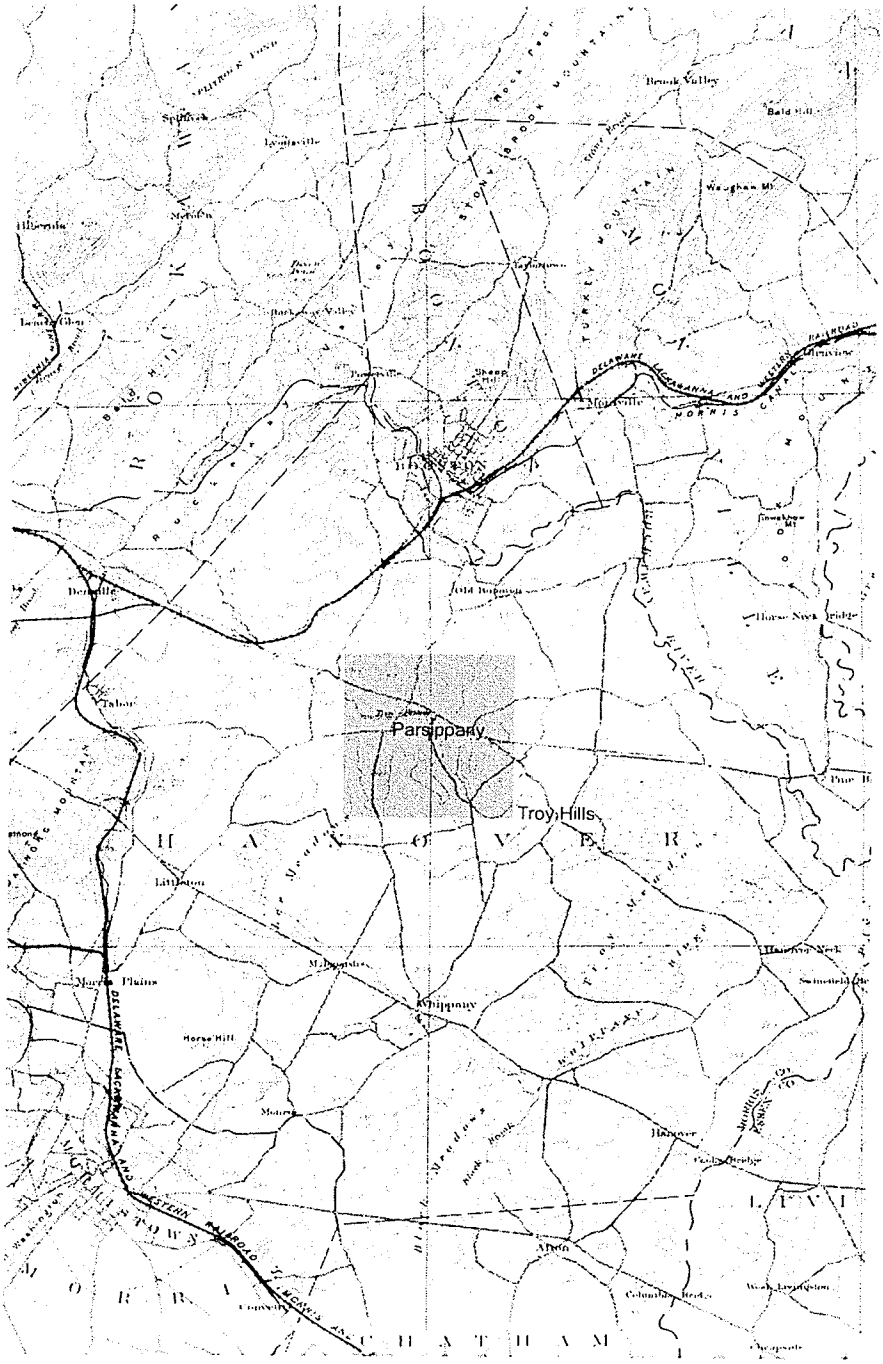


Figure A.3
Hanover County 1886

A.4 REGIONAL HISTORY

The land was originally named "Parseponong, a Lenapi Indian word meaning "the place where the rivers run together"[110]. Other aboriginal tribes inhabited the region's riverbanks: the Whippanongs, the Pomptons, the Rockawacks, the Parsippanongs, the Minisinks, and the Musconetcongs. The rivers were the first transportation corridors in the area and the paths that connected the waterways were the first ground networks[111]. The Minisink path was one of the area's main routes, traveling through the Pequannock valley, and was subsequently used by the first white settlers in the late 17th Century.

Attracted by the abundance of wildlife and wooded areas, the Dutch moved west from New York to settle along the Pequannock River and the Pompton Plains in the Eastern part of what is now Morris County. They were soon followed by the English who settled near Caldwell and Livingston.[112] The two settlements quickly cleared the heavily forested land and by 1725, the landscape had been transformed for agricultural production.

Shortly after European settlement, the first iron forge appeared to the south in Whippany. The abundance of ore in the region was initially unknown but would become an important industry in shaping the region for the next century. During the Revolutionary War, soldiers depended on munitions from Morris County. Military settlements were established close to the foundries. The roads were ill equipped to ship the ore any great distance. By water, flat boats and later, steam ships would carry heavy loads. But the rivers were not always convenient and were not necessarily close to the source of ore. Once the Morris Canal was constructed in 1830, the mines relocated closer to the water source. Iron forges required a continual flow of water to power the plants. Because of drier summer months, rivers were dammed to create reservoirs to control the flow of water. The canal provided not only a water supply, but a more direct route to transport the goods East.[113] The canals built in the 19th Century were major infrastructure projects that required technological ingenuity, water management and the moving of tons of earth. Privately funded, they were an effort to open up the interior of the country to the growing commercial trade.[114] The lifespan of the canal would be cut short however, as the railroad made inroads into the interior.

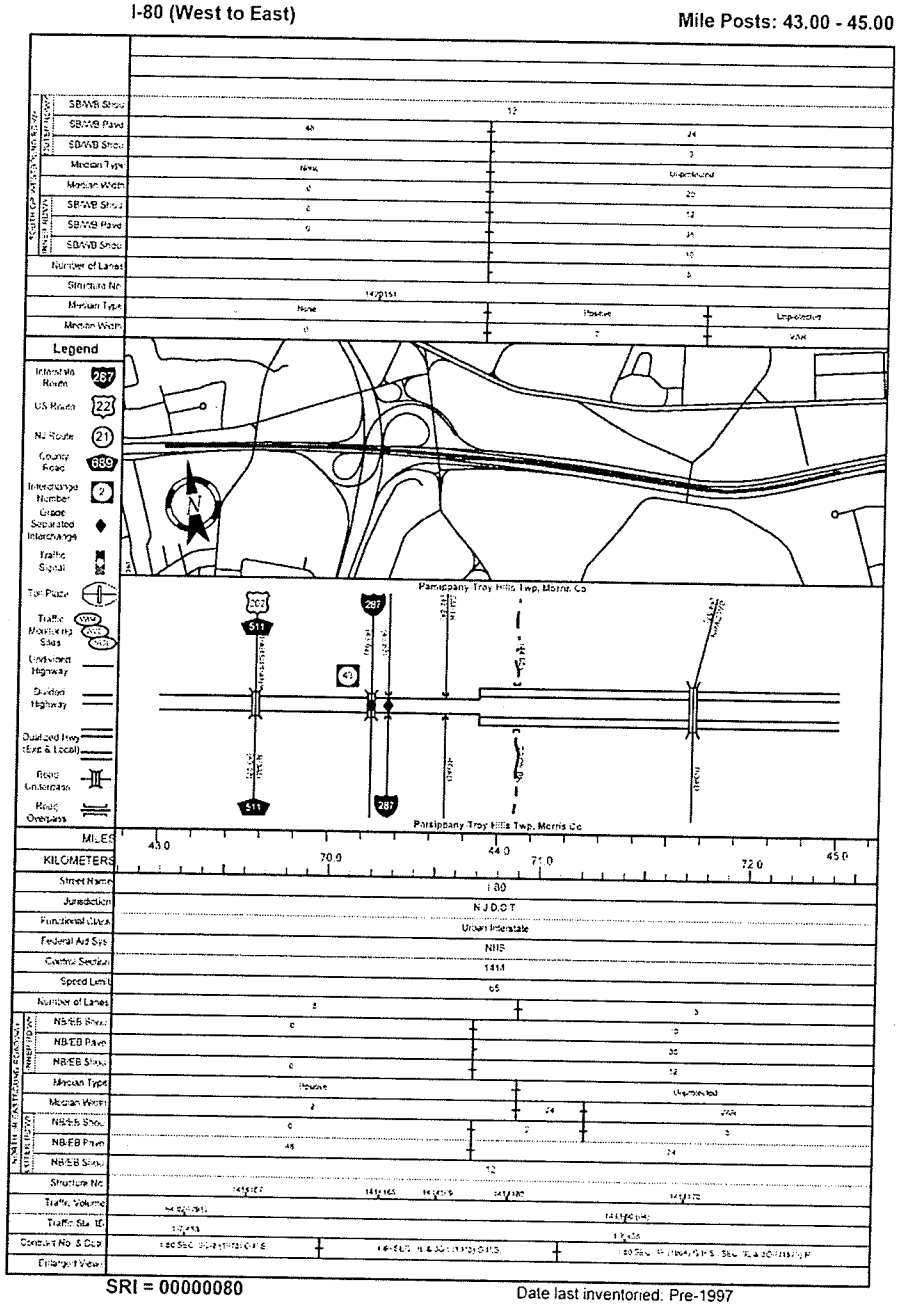


Figure A.4
Straight line diagram

A.5 EXIT MORPHOLOGY[115]

I-80

Exit 43a
(US 202, US 46, Parsippany to Morris Plains)
Veterinarian, Gulf/mart, Hess/mart, Texaco/repair, Black Bull Rest., Mtn Lakes Bagels, Paul's Diner, TGIFriday, Hampton Inn, White Deer Motel, Ford, Pontiac, Subaru, bank, cleaners

Exit 43b
(I-287, to US 46, Boonton, Morristown, Lake Hiawatha, Whippany)
Amoco, Gulf, Bennigan's, Chili's, IHOP, Red Lobster, Taco Bell, Wendy's, Holiday Inn/rest., Howard Johnson, Ramada Ltd., Red Roof Inn, Bradlee's, Drug Fair, K-Mart/auto, ShopRite Foods, RV camping, bank, cinema, laundry, repair, services
on US 46...Applebee's, Boston Market, Burger King, Empire Diner, AC Moore/crafts, CompUSA, Firestone/auto, S...Sheraton Tara.

I-287

Exit 41a
(NJ 511, Parsippany Rd to Whippany)
Chiropractor, Dentist, Mobil, Chinese Rest., Pizzaria, motel

Exit 41b
(I-80, E to New York, W to Allentown)
US 46, US 202, W...Exxon, Sunoco, Texaco, Fuddrucker's, Roy Rogers, Day's Inn, Embassy Suites, Hampton Inn, Chrysler/Jeep/Pontiac/Subaru, Ford, bank, cleaners/laundry, drugs

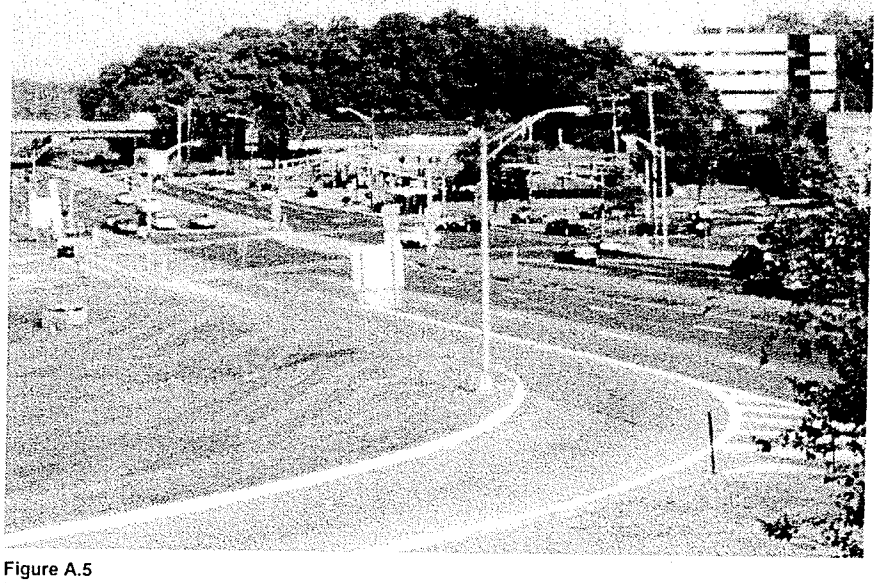


Figure A.5
Lanidex Executive Center

A.6 PROGRAM

Old Town

What *happens* in Parsippany? On what, for all intents and purposes, is the main drag, are the usual urban suspects: library, gas stations, memorial park with dedication plaque, police station, café, diner, and car dealerships. It is obvious however, that these are merely convenience programs as opposed to businesses that sustain the town. They are evidence of pre-Interstate City settlement. In Parsippany, farming, ironmongery and even leisure programs are supplanted by high tech industry, pharmaceutical manufacturing and distribution, and corporate conference centers.

UPS

The Interstate Highway System has enabled the success of UPS. Prior to 1950, the company was a regional courier in California. With the UPS has developed a 'ground feeder network' that is comprised of strategically located hubs linked by the Interstate Highway System. The UPS warehouse in Parsippany is classified as a centralized sorting hub that is fed by surrounding local operational facilities. Over 40,000 packages are sorted and loaded each hour, many coming from Pfizer's pharmaceutical distribution center across the street. Most of the packages arrive in the afternoon, are sorted by ZIP code and then consolidated on conveyor belts. The I-80 is the main corridor into New York City as well as the route to Newark airport, the primary departure point for European shipments.

Now that the infrastructure is in place, UPS is investing heavily into information technologies to improve their performance. Located 20 miles north up the I-287 from Parsippany is the UPS World Technology Headquarters in Mahwah, N.J. Almost 2,000 information technology professionals serve at the hub for UPS Global Network, one of two world data centers (the other in Atlanta). Information regarding parcel delivery status is processed and stored here. They spend over $1 billion on technology upgrades every year, recognizing the need to link physical and digital environments. [116]

Drugs

Since the 1940's, New Jersey has been a center for pharmaceutical research and distribution. Its heavily developed ground transportation network makes it an ideal location for expediting products around the country and the world. The I-80 corridor is home to many of the largest drug companies: Pfizer, BASF, Roche.

Pfizer Pharmaceuticals [117]

Pfizer Pharmaceuticals' Distribution Services Data Processing and Electronic Commerce Center sits indiscriminately on the other side of the Interstate wall. From this sprawling complex, almost $3 billion in domestic prescription drugs are shipped each year. Pfizer is the parent company to many of the most recognized brands on the market: Norvasc, Lipitor, Zoloft, Zithromax, Diflucan, Celebrex and Viagra Listerine, Halls cough tablets, Rolaids antacid, Benadryl and Sudafed cold medications, Dentyne, Trident gums, Clorets, and Certs breath mints. The Parsippany hub is the main distribution point for Ben Gay ointment and Visine eye lotion.

Roche Vitamins Inc. [118]

Roche Vitamins Inc., a member of the Roche Group, is a major producer of ingredients for use in cosmetics and toiletries, supporting the industry with many product forms, innovative packaging, and the latest in technology and marketing know-how. From worldwide manufacturing facilities and affiliates around the globe, the Cosmetic & Specialty Chemicals Group provides the industry with the following ingredients: Vitamins - Vitamin A Palmitate, Vitamin A Acetate, Vitamin B1 (Thiamine), Vitamin B2 (Riboflavin), Vitamin B3 (Niacin, Niacinamide), Vitamin B5 (Panthenol, Calcium Pantothenate), Vitamin B6 (Pyridoxine), Vitamin B12 (Cyanocobalamin), Vitamin C (Ascorbic Acid, Ascorbyl Palmitate), Vitamin D3 (Cholecalciferol), Vitamin E (Free Tocopherol, Tocopheryl Acetate), Vitamin H (Biotin), Vitamin K1 (Phytonadione), and Folic Acid. Unique Vitamin Derivatives - Ethyl Panthenol. UVB Filters - Parsol® HS (Phenylbenzimidazole Sulfonic Acid). UVA Filters - Parsol® 1789 (Avobenzone). Phospholipid Emulsifiers - Amphisol® (Diethdeanolamine Cetyl Phosphate), Amphisol® A (Cetyl Phospate), Amphisol® K (Potassium Cetyl Phosphate). Acidulants - Citric Acid and its salts. Colorants - Beta Carotene (ProVitamin A). Unique Moisturizers - Phytantriol. Natural Oils - Omega-6 Oils (Evening Primrose Oil, Borage Oil).

Active in more than 100 countries, Roche Vitamins Inc. employ approximately 66,000 people worldwide with 1999 sales at about $18.4 billion.

Lanidex Executive Center

Located at the southwest corner of the Parsippany Interchange is the Lanidex Executive Center, a non-descript office park consisting of (six) two and three story buildings. A combined 280,000 square feet house predominantly software and communication companies. At number 500 is Captaris, "a leading provider of unified communication, mobile business, e-document delivery, network fax, unified messaging and speech recognition solutions". They specialize in mobile technologies that allow accessibility to office networks and the "information you need, when you need it".

Figure A.6
Parsippany: new community

Figure A.7
Parsippany: Lanidex Office Center

igure A.8
I-80, Parsippany: A concrete wall focuses the dynamics of Interstate City inward

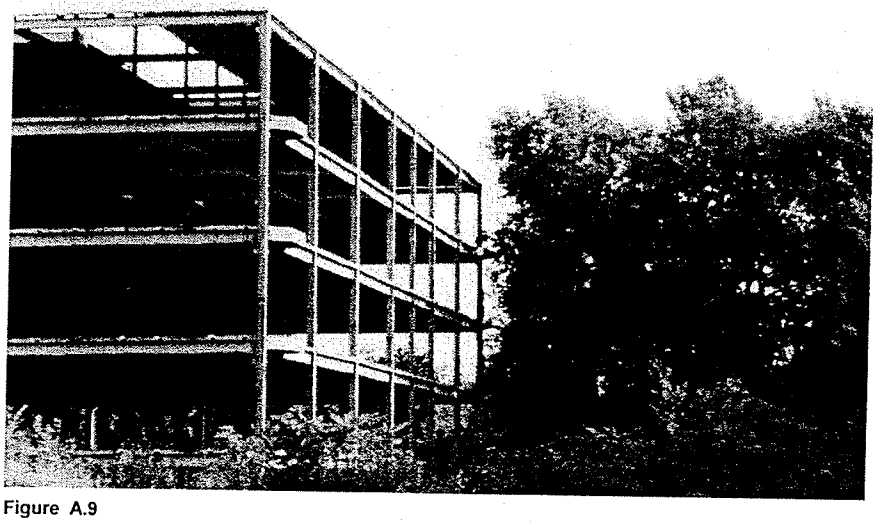


Figure A.9
Abandoned

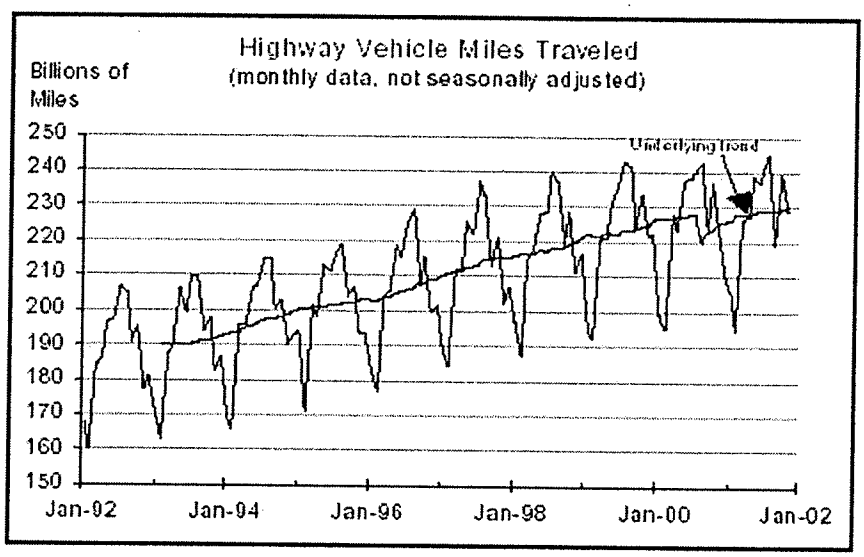
Figure A.10
Dead gopher

A.7 WALL

The I-80 between Newark and Parsippany-Troy Hills, New Jersey is contained between two, twenty-foot high salmon colored concrete walls. Used to dampen the visual and acoustic impact of the highway on adjacent landscapes, the walls intensify the interior focus of Interstate City. The Great Walls isolate the life and culture of the highway from the history, geography and community of its context. By keeping nature at bay, this stretch of the I-80 landscape is in essence the inverted walled garden of Interstate City. In separating itself from the landscape, it tunnels through regions to create its own artificial mobile city. While the use of the walls as a physical and psychological metaphor for isolation is obvious, the highway also manifests that idea in its 100-foot wide ditches, roadside plantings, smooth surfaces, and destructive routing. Add automotive refinement, digital dependence and the spatial shift from distances to intervals and the introversion of Interstate City appears complete.

B

Appendix *Facts + Figures*



Vehicle miles of travel (VMT) are key data for highway planning and management, and a common measure of roadway use. Along with other data, VMT are often used in estimating congestion, air quality, and potential gas tax revenues, and can provide a general measure of the level of the nation's economic activity.

Figure B.1
Highway Vehicle Miles Traveled
from U.S. Department of Transportation, *Transportation Indicators* (Bureau of Transportation Statistics, February 2002), 22.

	1960	1965	1970	1975	1980	1985
Air						
Air carrier, large certificated, domestic, all services	858	1,134	2,068	1,948	2,523	3,046
General aviation[a]	1,769	2,562	3,207	4,238	5,204	4,673
Highway[R]						
Passenger car[b,c]	587,012	722,696	916,700	1,033,950	1,111,596	1,246,798
Motorcycle[b]	[h]	[h]	2,979	5,629	10,214	9,086
Other 2-axle 4-tire vehicle[c]	[h]	[h]	123,286	200,700	290,935	390,961
Truck						
Single-unit 2-axle 6-tire or more truck	98,551	128,769	27,081	34,606	39,813	45,441
Combination truck	28,854	31,665	35,134	46,724	68,678	78,063
Bus	4,346	4,681	4,544	6,055	6,059	4,478
Total highway[c]	**718,763**	**887,811**	**1,109,724**	**1,327,664**	**1,527,295**	**1,774,827**
Transit						
Motor bus[d]	1,576	1,528	1,409	1,526	1,677	1,863
Light rail	75	42	34	24	18	17
Heavy rail	391	395	407	423	385	451
Trolley bus	101	43	33	15	13	16
Commuter rail	N	N	N	173	179	183
Demand responsive[d]	N	N	N	N	N	247
Ferry boat	N	N	N	N	[i]	[i]
Other	N	N	N	15	15	15
Total transit[e]	**2,143**	**2,008**	**1,883**	**2,176**	**2,287**	**2,791**
Rail						
Class I freight, train-miles	404	421	427	403	428	347
Class I freight, car-miles	28,170	29,336	29,890	27,656	29,277	24,920
Intercity/Amtrak[f], train-miles	209	172	93	30	30	30
Intercity/Amtrak[f], car-miles	2,208	1,775	690	253	235	251
Total train-miles[g]	**613**	**593**	**520**	**433**	**458**	**377**

table continued on following page

Figure B.2
Vehicle Travel Comparison
from U.S. Department of Housing and Urban Development, *American Housing Survey* (Washington D.C.: Various years)

1990	1991	1992	1993	1994	1995	1996	1997	1998
3,963	3,854	3,995	4,157	4,380	4,629	4,811	4,911	5,035
4,548	4,400	3,465	3,253	3,358	3,795	3,524	3,877	U
1,408,266	1,358,185	1,371,569	1,374,709	1,406,089	1,428,497	1,469,854	1,502,556	1,549,577
9,557	9,178	9,557	9,906	10,240	9,797	9,920	10,081	10,283
574,571	649,394	706,863	745,750	764,634	790,029	816,540	850,739	868,275
51,901	52,898	53,874	56,772	61,284	62,705	64,072	66,893	68,021
94,341	96,645	99,510	103,116	108,932	115,451	118,899	124,584	128,359
5,726	5,750	5,778	6,125	6,409	6,420	6,563	6,842	7,007
2,144,362	**2,172,050**	**2,247,151**	**2,296,378**	**2,357,588**	**2,412,899**	**2,485,848**	**2,561,695**	**2,631,522**
2,130	2,167	2,178	2,210	2,162	2,184	2,221	[R]2,245	[P]2,291
24	28	29	28	34	35	38	41	[P]43
537	527	525	522	532	537	543	558	[P]566
14	14	14	13	14	14	14	14	[P]14
213	215	219	224	231	238	242	251	[P]265
306	335	364	406	464	507	548	[R]585	[P]698
2	2	2	3	2	3	3	2	2
[R]18	[R]22	[R]26	[R]32	[R]32	[R]37	[R]45	[R]52	53
3,242	**3,306**	**3,355**	**3,435**	**3,468**	**3,550**	**3,650**	**[R]3,746**	**[P]3,932**
380	375	390	405	441	458	469	475	475
26,159	25,628	26,128	26,883	28,485	30,383	31,715	31,660	32,657
33	34	34	35	34	32	30	32	33
301	313	307	303	304	292	[R]276	288	312
413	**409**	**424**	**440**	**475**	**490**	**499**	**507**	**508**

Figure B.2 (continued)

OCTOBER 2001

	ASIA	EUROPE				AMERICA		
	JAPAN (1998)	FRANCE (1999)	GERMANY (1998)	SWEDEN (1998)	UNITED KINGDOM (1999)	CANADA	MEXICO	UNITED STATES (1999)
Total Vehicle Kilometers of Travel Automobiles (in millions)	482,551	402,000	528,000	56,992	380,100	N/A	N/A	2,529,267
Total Vehicle Kilometers of Travel Automobiles (Per Capita)	3,813	6,776	6,377	6,423	6,387	N/A	N/A	9,179
Total Vehicle Kilometers of Travel Motorcycles (in millions)	N/A	4,000	15,400	600	4,600	N/A	N/A	17,061
Total Vehicle Kilometers of Travel Buses (in millions)	6,520	2,300	3,700	1,172	5,000	N/A	N/A	11,925
Total Vehicle Kilometers of Travel Trucks (in millions) 1/	256,983	112,000	57,800	8,642	77,300	N/A	N/A	1,773,035
Average Vehicle Kilometers of Travel per Automobile	9,671	14,629	12,475	15,029	17,187	N/A	N/A	19,099
Average Vehicle Kilometers of Travel per Motorcycle	N/A	1,723	3,377	2,378	6,725	N/A	N/A	4,109
Average Vehicle Kilometers of Travel per Bus	27,429	28,750	43,690	77,616	62,500	N/A	N/A	16,363
Average Vehicle Kilometers of Travel per Truck	12,347	19,512	13,192	25,544	25,025	N/A	N/A	16,363

1/ U.S. data are light 2-axle 4-tire trucks such as vans, sport utility vehicles, pickup trucks, heavy single-unit trucks, and combination trucks. Non-U.S. data does not include travel by combination trucks.

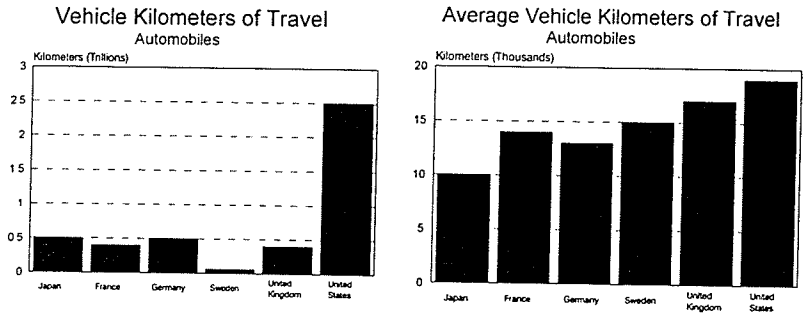


Figure B.3
Vehicle Travel
Prepared from *World Road Statistics*, *International Road Federation*, and *FHWA's Highway Statistics 1999*.

Annual U.S. Motor Vehicle Production and Factory (Wholesale) Sales (Thousands)

	1960	1965	1970	1975	1980	1985	1990	1991	1992	1993	1994	1995	1996
Production													
Passenger cars	6,703	9,335	6,550	6,717	6,376	8,185	6,077	5,439	5,664	5,981	6,614	6,351	6,063
Commercial vehicles[a]	1,202	1,785	1,734	2,270	1,634	3,468	3,706	3,372	4,038	4,917	5,649	5,635	5,749
Total	7,905	11,120	8,284	8,987	8,010	11,653	9,783	8,811	9,702	10,898	12,263	11,985	11,833
Factory (wholesale) sales													
Passenger cars	6,675	9,306	6,547	6,713	6,400	8,002	6,050	5,407	5,685	5,962	6,549	6,310	6,140
Commercial vehicles[a]	1,194	1,752	1,692	2,272	1,667	3,464	3,725	3,388	4,062	4,895	5,640	5,713	5,776
Total	7,869	11,057	8,239	8,985	8,067	11,467	9,775	8,795	9,747	10,857	12,189	12,023	11,916

[a] Includes trucks under 10,000 pounds gross vehicle weight rating (gvwr), such as compact and conventional pickups, sport utility vehicles, minivans, and vans, and trucks and buses over 10,000 pounds gvw

NOTES: Factory sales can be greater than production total because of sales from previous year's inventory.
Numbers may not add to totals due to rounding.

Figure B.4
Production
from *Ward's Motor Vehicle Facts & Figures 1999* (Southfield, MI: 1999), 3.

Principal Means of Transportation to Work
(Thousands)

	1985		1989		1993		1997		1999	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All workers	99,592	100.0	106,630	100.0	103,741	100.0	116,469	100.0	118,041	100
Automobile	86,148	86.5	93,943	88.1	91,301	88.0	101,907	87.5	103,466	87.7
Drives self	72,137	72.4	81,322	76.3	79,449	76.6	90,207	77.5	92,363	78.2
Carpool	14,011	14.1	12,621	11.8	11,852	11.4	11,700	10.0	11,103	9.4
2 person	10,381	10.4	9,708	9.1	9,105	8.8	9,294	8.0	8,705	7.4
3 person	2,024	2.0	1,748	1.6	1,684	1.6	1,526	1.3	1,454	1.2
4+ person	1,606	1.6	1,165	1.1	1,063	1.0	881	0.8	945	0.8
Public transportation[a]	5,091	5.1	4,880	4.6	4,740	4.6	5,337	4.6	5,779	4.9
Taxicab	129	0.1	152	0.1	117	0.1	139	0.1	144	0.1
Bicycle or motorcycle	958	1.0	795	0.7	744	0.7	738	0.6	749	0.6
Walks only	4,032	4.0	3,634	3.4	3,227	3.1	3,869	3.3	3,627	3.1
Other means[b]	286	0.3	491	0.5	474	0.5	867	0.7	987	0.8
Works at home	2,947	3.0	2,736	2.6	3,137	3.0	3,611	3.1	3,288	2.8

[a] Public transportation refers to bus, streetcar, subway, or elevated trains.
[b] Other means include ferryboats, surface trains, and van service.

Figure B.5
Work
from *Ward's Motor Vehicle Facts & Figures 1999* (Southfield, MI: 1999).

Year	Population	Drivers	Motor Vehicles
	(millions)	(millions)	(millions)
1960	**180**	**87**	**74**
1961	183	89	76
1962	186	91	79
1963	188	94	83
1964	191	95	86
1965	194	99	90
1966	196	101	94
1967	197	103	97
1968	199	105	101
1969	201	108	105
1970	204	112	108
1971	207	114	113
1972	209	118	119
1973	211	122	126
1974	213	125	130
1975	215	130	133
1976	218	134	139
1977	220	138	142
1978	222	141	148
1979	225	143	152
1980	227	145	156
1981	230	147	158
1982	232	150	160
1983	234	154	164
1984	236	155	166
1985	239	157	172
1986	241	159	176
1987	243	161	179
1988	246	163	184
1989	248	166	187
1990	248	167	189
1991	252	169	188
1992	255	173	190
1993	258	173	194
1994	260	175	198
1995	263	177	202
1996	265	180	206
1997	268	183	208
1998	270	185	208
1999	273	187	212
2000	**281**	**191**	**218**

1960: 0.41 vehicles/person
2000: 0.76 vehicles/person

1960: 0.85 vehicles/driver
2000: 1.14 vehicles/driver

Figure B.6
Population/Drivers/Vehicles
from U.S. Department of Transportation, *Transportation Indicators* (Bureau of Transportation Statistics, February 2002).

ANNUAL VEHICLE DISTANCE TRAVELED IN KILOMETERS AND RELATED DATA - 2000 1/
BY HIGHWAY CATEGORY AND VEHICLE TYPE

October 2001

YEAR	ITEM	PASSENGER CARS	MOTOR-CYCLES	BUSES	OTHER 2-AXLE 4-TIRE VEHICLES 2/	SINGLE-UNIT 2-AXLE 6-TIRE OR MORE TRUCKS 3/	COMBINATION TRUCKS	SUBTOTALS: PASSENGER CARS AND OTHER 2-AXLE 4-TIRE VEHICLES	SUBTOTALS: SINGLE-UNIT 2-AXLE 6-TIRE OR MORE AND COMBINATION TRUCKS	ALL MOTOR VEHICLES
	Motor-Vehicle Travel (millions of vehicle-kilometers)									
2000	Interstate Rural	217,120	1,879	1,579	127,702	13,299	71,447	344,822	84,746	433,026
1999		210,678	1,771	1,563	122,666	12,998	69,191	333,344	82,189	418,867
2000	Other Arterial Rural	377,909	2,705	2,045	227,408	21,965	45,085	605,317	67,050	677,116
1999		372,098	2,676	2,214	222,945	22,505	43,008	595,043	65,513	665,445
2000	Other Rural	361,902	2,684	3,618	226,021	22,152	20,268	587,924	42,420	636,648
1999		358,695	2,714	3,737	220,559	22,484	19,700	579,254	42,184	627,889
2000	All Rural	956,931	7,268	7,242	581,131	57,416	136,800	1,538,062	194,216	1,746,787
1999		941,472	7,161	7,514	566,189	57,986	131,899	1,507,641	189,885	1,712,201
2000	Interstate Urban	371,231	2,724	1,274	206,608	14,038	37,790	577,839	51,828	633,664
1999		360,853	2,721	1,211	200,282	13,675	38,305	561,135	51,980	617,047
2000	Other Urban	1,250,920	6,880	3,722	699,930	42,185	43,095	1,950,850	85,280	2,046,732
1999		1,223,927	7,158	3,611	684,194	41,528	42,934	1,908,120	84,462	2,003,352
2000	All Urban 4/	1,622,151	9,604	4,996	906,538	56,223	80,885	2,528,689	137,108	2,680,396
1999		1,584,779	9,879	4,822	884,476	55,204	81,239	2,469,255	136,443	2,620,399
2000	Total Rural and Urban	2,579,082	16,871	12,238	1,487,669	113,639	217,685	4,066,751	331,324	4,427,183
1999		2,526,251	17,040	12,336	1,450,645	113,189	213,138	3,976,896	326,328	4,332,600
2000	Number of motor vehicles	133,621,420	4,346,068	746,125	79,084,979	5,926,030	2,096,619	212,706,399	8,022,649	225,821,241
1999	registered 5/	132,432,044	4,152,433	728,777	75,356,376	5,762,864	2,028,562	207,788,420	7,791,426	220,461,056
2000	Average kilometers traveled	19,301	3,882	16,402	18,811	19,176	103,827	19,119	41,299	19,605
1999	per vehicle	19,078	4,104	16,927	19,250	19,641	105,069	19,139	41,883	19,652
2000	Person-kilometers of travel 6/	4,100,741	16,558	259,455	2,365,394	113,639	217,685	6,466,135	331,324	7,075,471
1999	(millions)	4,016,741	18,744	261,537	2,306,526	113,189	213,138	6,323,267	326,328	6,929,875
2000	Fuel consumed 7/	275,620,601	792,212	4,196,688	199,703,112	36,092,574	96,938,353	475,323,713	133,030,927	613,343,541
1999	(thousand liters)	277,009,464	800,150	4,340,600	199,807,277	35,426,428	92,751,070	476,816,741	128,177,498	610,134,990
2000	Average fuel consumption per	2,064	181	5,625	2,525	6,090	46,237	2,234	16,583	2,718
1999	vehicle (liters) 7/	2,090	193	5,957	2,650	6,146	45,723	2,294	16,451	2,767
2000	Average kilometers traveled per	9.4	21.5	2.9	7.5	3.2	2.3	8.6	2.5	7.3
1999	liter of fuel consumed 7/	9.2	21.5	2.9	7.3	3.2	2.3	8.4	2.6	7.2

1/ The 50 states and the District of Columbia report travel by highway category, number of motor vehicles registered, and total fuel consumed. The travel and fuel data by vehicle type and stratification of trucks, as well as related data, are calculated by the Federal Highway Administration (FHWA). Entries for 1999 may have been revised based on the availability of more current data. Estimation procedures include use of the 1997 Census of Transportation Vehicle Inventory and Use Survey (VIUS) and independent analysis of light truck travel.

2/ Other 2-Axle 4-Tire Vehicles which are not passenger cars. These include vans, pickup trucks, and sport/utility vehicles.

3/ Single-Unit 2-Axle 6-Tire or More Trucks on a single frame with at least two axles and six tires.

4/ Urban consists of travel on all roads and streets in urban places with 5,000 or greater population.

5/ Stratification of the truck figures is made by the FHWA based on State-supplied data and the 1997 VIUS. Combination trucks represent approximately the number of tractors with semi-trailers and a majority of heavy single-unit trucks used regularly in combination with trailer(s).

6/ As estimated by the FHWA using the 1995 Nationwide Personal Transportation Survey (NPTS).

7/ Total fuel consumption figures are derived from state fuel tax records and reflect latest available data. Distribution by vehicle type is estimated by the FHWA based on miles per gallon for both diesel and gasoline powered vehicles using State-supplied data, the 1997 VIUS, and other sources as a baseline. Kilometers and liters were calculated using SI metric conversion factors.

Figure B.7
Distance
from *Ward's Motor Vehicle Facts & Figures 1999* (Southfield, MI: 1999).

Acceleration: New York to San Francisco

1808	Frontier Trails	4-6 months
1869	Railroad	6 days
1919	Lincoln Highway	62 days
1950	US Route 40	7-8 days

Figure B.8
Continental Passage
from *Rand McNally Road Atlas 2002*; and Raitz, K et al. *National Road,* (Baltimore: The Johns Hopkins University Press, 1996)

State	Mileage	Cities	Junctions
California	202.2	San Francisco, Oakland, El Cerrito, Pinole, Vallejo, Fairfield, Vacaville, Davis, Sacramento, Auburn, Truckee	Interstate 880, Interstate 580, Interstate 780, Interstate 680, Interstate 305, Interstate 5
Nevada	410.67	Verdi, Reno, Sparks, Fernley, Lovelock, Winnemucca, Battle Mountain, Carlin, Elko, Wendover	Interstate 580
Utah	197.58	Salt Lake City, Park City, Echo	Interstate 215, Interstate 15, Interstate 15, Interstate 215, Interstate 84
Wyoming	402.86	Evanston, Lyman, Green River, Rock Springs, Raw lins, Laramie, Cheyenne, Pine Bluffs	Interstate 25, Interstate 180
Nebraska	455.31	Kimball, Sidney, Ogallala, North Platte, Lexington, Kearney, Grand Island, Sew ard, York, Lincoln, Omaha	Interstate 76, Interstate 180, Interstate 680, Interstate 480
Iow a	306.57	Council Bluffs, Des Moines, New ton, Iow a City, Davenport	Interstate 29, Interstate 29, Interstate 680, Interstate 35/Interstate 235, Interstate 35/Interstate 235, Interstate 380, Interstate 280, Interstate 74
Illinois	163.52	Moline, Genesco, Princeton, La Salle, Ottaw a, Morris, Joliet, Chicago	Interstate 88, Interstate 74/Interstate 280, Interstate 180, Interstate 39, Interstate 55, Interstate 294, Interstate 94
Indiana	151.65	Hammond, Gary, South Bend, Elkhart	Interstate 65, Interstate 90/Interstate 94
Ohio	237.07	Toledo, Elyria, Cleveland, Youngstow n	Interstate 475, Interstate 75, Interstate 280, Interstate 90, Interstate 480, Interstate 71, Interstate 77, Interstate 271, Interstate 480, Interstate 76, Interstate 680
Pennsylvania	311.24	Sharon, Mercer, Clarion, Dubois, Milton, Bloomsburg, Stroudsburg	Interstate 79, Future Interstate 99, Interstate 180, Interstate 81, Interstate 380
New Jersey	68.1	Paterson, Hackensack, Tenneck	Interstate 287, Interstate 280, Garden State Parkw ay, Interstate 95
TOTAL	2,906.77		

Figure B.9
I-80 Exit Junctions
from *Interstate Route Log and Finders List*, January 1991.

East-West: I-80

0 miles	New York City	0:00
481	Cleveland	9:13
345	Chicago	6:58
362	Des Moines	7:10
143	Omaha	2:16
285	North Platte	5:23
215	Cheyenne	4:10
146	Rawlins	2:43
294	Salt Lake City	5:30
362	Winnemucca	7:07
164	Reno	3:16
228	San Francisco	4:35
3025		**59 hours**

Figure B.10
I-80 Major Cities: Time/Distance
from *Rand McNally Road Atlas 2002*- Millenium Edition

Service Type: GROUND Weight: 3.00 Lbs

Date	Time	Location	Activity
11-Nov-02	11:52 AM	Brooklyn, NY	Delivery
	6:30 AM	Brooklyn, NY	Out for Delivery
	4:20 AM	Brooklyn, NY	Arrival Scan
9-Nov-02	2:12 AM	Secaucus, NJ	Departure Scan
8-Nov-02	5:01 PM	Secaucus, NJ	Arrival Scan
5-Nov-02	12:12 AM	Laguna Hills, CA	Departure Scan
4-Nov-02	7:06 PM	Laguna Hills, CA	Billing Info Received
	6:02 PM	Laguna Hills, CA	Origin Scan

Figure B.11
Status of package shipped from California to New York by UPS Ground Delivery
from UPS.com

Design Speed (mph)	Maximum e	Maximum f	Total (e+f)	Maximum Degree of Curve	Rounded Maximum Degree of Curve	Maximum* Radius (ft)
20	.04	.17	.21	44.97	45.0	127
30	.04	.16	.20	19.04	19.0	302
40	.04	.15	.19	10.17	10.0	573
50	.04	.14	.18	6.17	6.0	955
55	.04	.13	.17	4.83	4.75	1,186
60	.04	.12	.16	3.81	3.75	1,528
20	.06	.17	.23	49.25	49.25	116
30	.06	.16	.22	20.94	21.0	273
40	.06	.15	.21	11.24	11.25	509
50	.06	.14	.20	6.85	6.75	849
55	.06	.13	.19	5.40	5.5	1,061
60	.06	.12	.18	4.28	4.25	1,348
65	.06	.11	.17	3.45	3.5	1,637
70	.06	.10	.16	2.80	2.75	2,083
20	.08	.17	.25	53.54	53.5	107
30	.08	.16	.24	22.84	22.75	252
40	.08	.15	.23	12.31	12.25	468
50	.08	.14	.22	7.54	7.5	764
55	.08	.13	.21	5.97	6.0	960
60	.08	.12	.20	4.76	4.75	1,206
65	.08	.11	.19	3.85	3.75	1,528
70	.08	.10	.18	3.15	3.0	1,910
20	.10	.17	.27	57.82	58.0	99
30	.10	.16	.26	24.75	24.75	231
40	.10	.15	.25	13.38	13.25	432
50	.10	.14	.24	8.22	8.25	694
55	.10	.13	.23	6.53	6.5	877
60	.10	.12	.22	5.23	5.25	1,091
65	.10	.11	.21	4.26	4.25	1,348
70	.10	.10	.20	3.50	3.5	1,637
20	.12	.17	.29	62.10	62.0	92
30	.12	.16	.28	26.65	26.75	214
40	.12	.15	.27	14.46	14.5	395
50	.12	.14	.26	8.91	9.0	637
55	.12	.13	.25	7.10	7.0	807
60	.12	.12	.24	5.71	5.75	996
65	.12	.11	.23	4.66	4.75	1206
70	.12	.10	.22	3.85	3.75	1528

NOTE: In recognition of safety considerations, use of $e_{max} = 0.04$ should be limited to urban conditions.
*Calculated using rounded maximum degree of curve.

Figure B.12
Maximum degree of curve and minimum radius determined for limiting values of e and f, rural highways and high-speed urban streets.
from AASHTO, *A Policy on Geometric Design of Highways and Streets: 1990*, (AASHTO: Washington, D.C., 1990), 154.

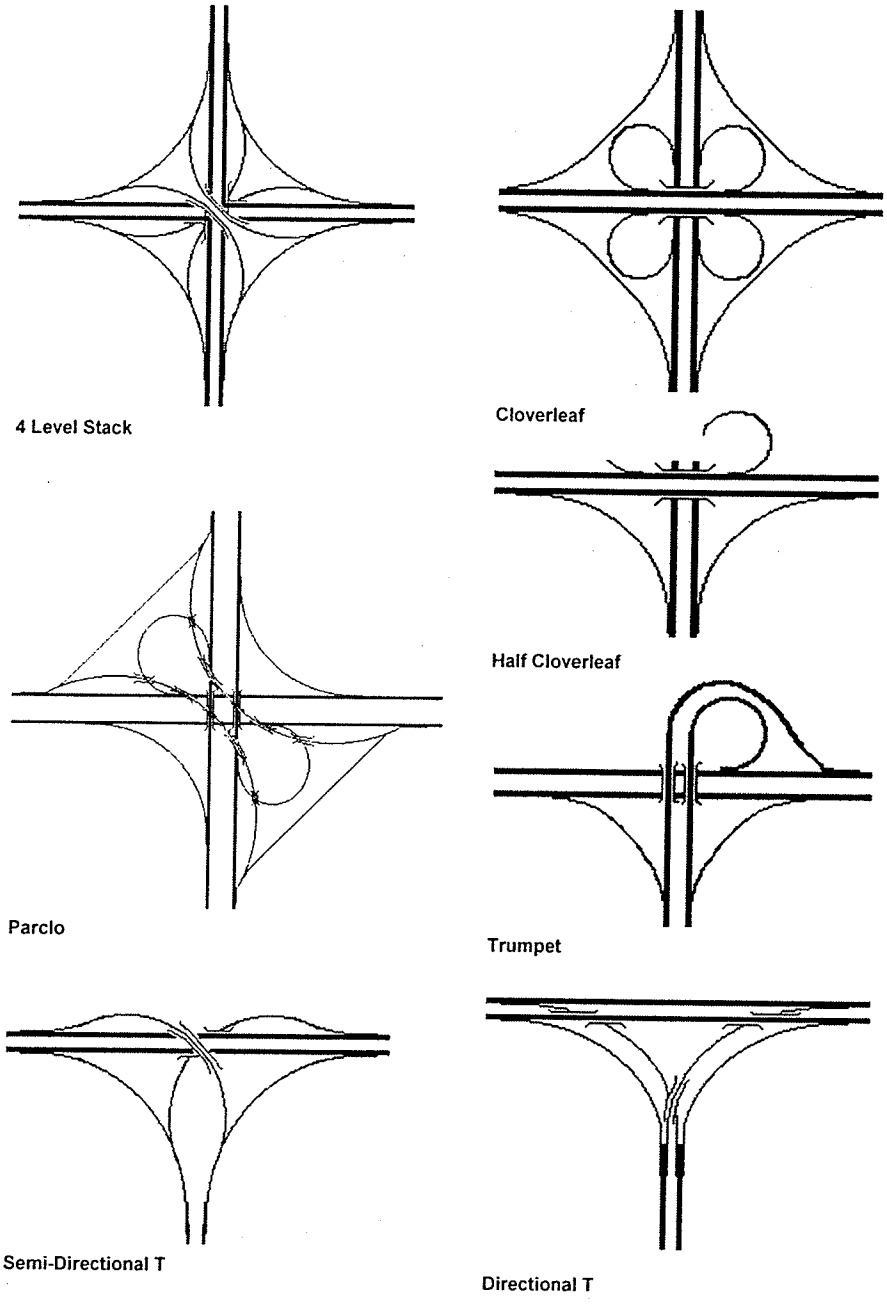
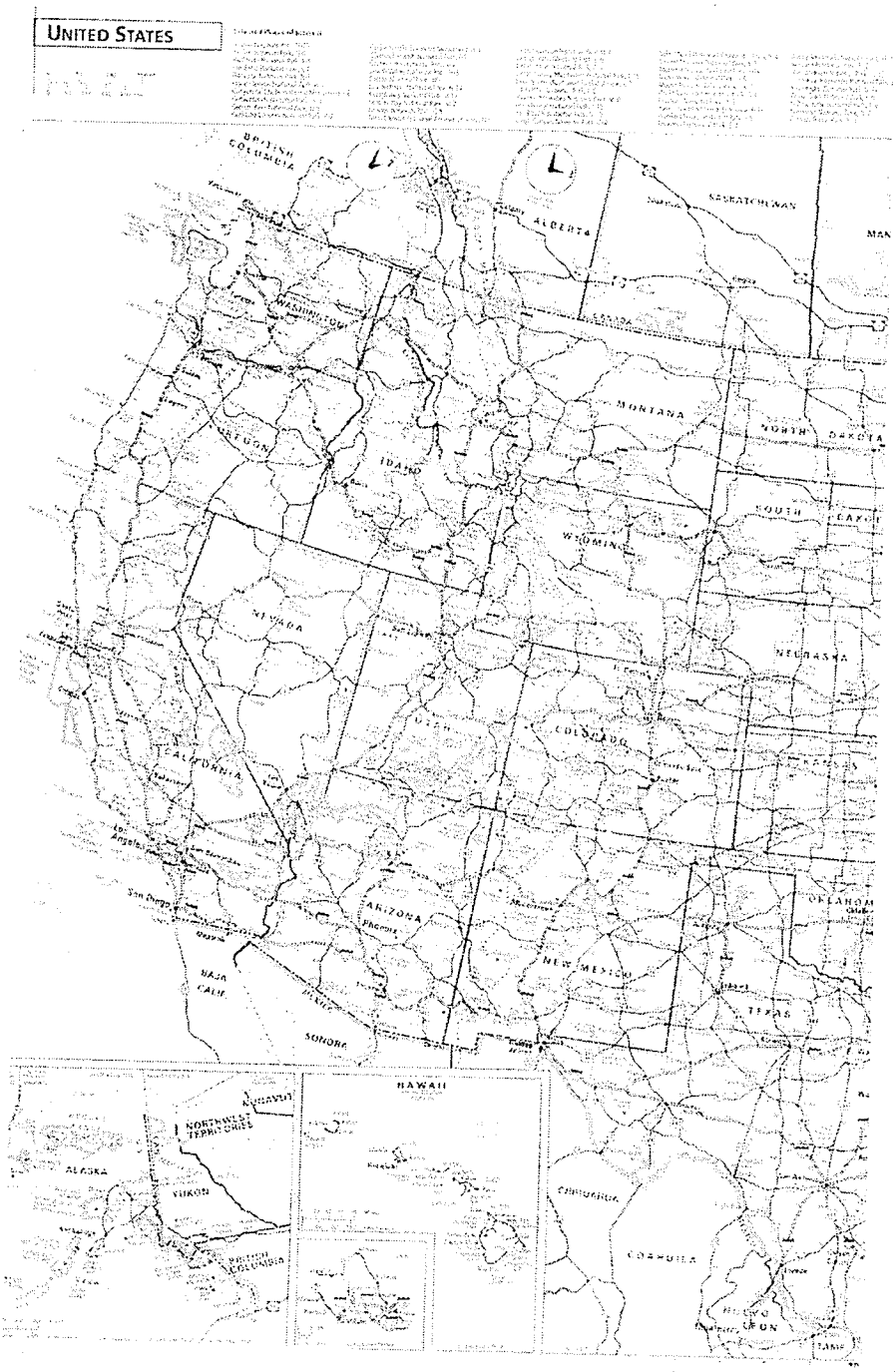
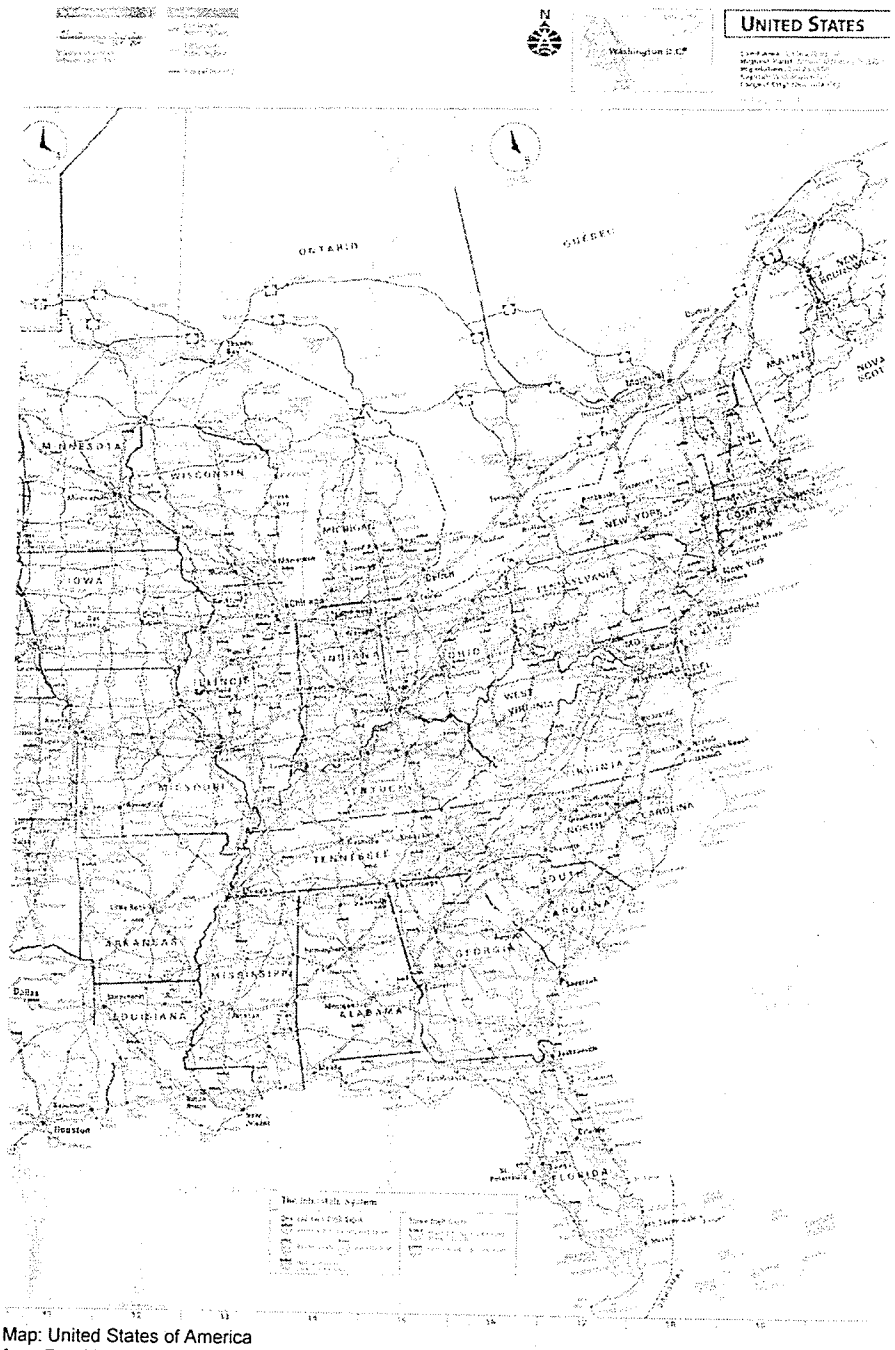


Figure B.13
Interchange Typology
from www.anglefire.com/on3/donovanmartin/interchanges/3way.html


UNITED STATES
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MONTANA
NORTH DAKOTA
SOUTH DAKOTA
WYOMING
NEBRASKA
NEVADA
COLORADO
CALIFORNIA
ARIZONA
NEW MEXICO
TEXAS
OKLAHOMA
BAJA CALIF.
SONORA
HAWAII
ALASKA
YUKON
COAHUILA



Map: United States of America
from Rand McNally Road Atlas 2000- Millenium Edition, map 2-3.

Note: All images by Erik Millward unless otherwise noted.

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[1] Baudrillard, Jean. *America*, Trans. by Chris Turner (New York: Verso, 1988).
[2] Appel, N.L. "The Continuing Saga of Ideology and Urban Transformation or a search for meaning of the City in an Emerging 21st Century Culture" in *The City of the 21st Century*, ed. M. Phylak (Conference Proceedings, Arizona State University, Tempe, Arizona, 1988), 18.
[3] Frank Lloyd Wright, *An Autobiography*
[4] Cox, Wendell, Love, Jean. "40 Years of the US Interstate Highway System: An Analysis. The Best Investment A Nation Ever Made" (American Highway Users Alliance: June 1996), online publication: www.publicpurpose.com/freeway.htm
Since its inception, the Interstate Highway System has spawned an estimated $2.5 trillion dollars in economic growth
[5] Baudrillard, 16.
[6] Harris, Steven and Berke, Deborah. *Architecture of the Everyday* (New York: Princeton Architectural Press, 1997) 3·
[7] Raitz, Karl ed. *The National Road* (Baltimore: The Johns Hopkins University Press, 1996) cover leaf.
[8] Raitz, cover leaf.
[9] Raitz, 18
[10] By 1850 however, interest and enthusiasm for the National Road was all but forgotten with the introduction of the steam engine.
[11] Steinbeck, John. *Travels with Charley: In Search of America* (paperback), (New York: Penguin Books, 1980).
[12] Giedion, Sigfried. *Mechanization Take Command*, (Oxford University Press, 1948), 151.
[13] The Federal Aid Road Act of 1916 launched the federal-aid highway program.
[14] Jackson, Kenneth. Crabgrass Frontier: The Suburbanization of the United States, 168-71; and Schlosser, E. Fast Food Nation: The Dark Side of the All-American Meal, paperback, (New York: Harper Collins Publishing, 2002), 16,17.
[15] Jackson, Kenneth. Crabgrass Frontier: The Suburbanization of the United States, 168-71; and Schlosser, E. Fast Food Nation: The Dark Side of the All-American Meal, paperback, (New York: Harper Collins Publishing, 2002), 16,17.
[16] Weingroff , Richard F. "Federal-Aid Highway Act of 1956: Creating the Interstate Highway System", *Public Roads*, (Summer 1996 -- Volume 60, No. 1)
[17] Ward's Motor Vehicle Facts and Figures 2001 (Southfield, MI: Ward's Communications, 2001.
[18] Weingroff, 10.
[19] Ibid.
[20] Vanderbilt, Tom. *Survival City: Adventures in the Ruins of Atomic America*, (New York: Princeton Architectural Press, 2002), 126.
[21] Cox, Wendell, Love, Jean. "40 Years of the US Interstate Highway System: An Analysis. The Best Investment A Nation Ever Made" (American Highway UsersmAlliance: June 1996), online publication: www.publicpurpose.com/freeway.htm
[22] Bugge, W.A., and W. Brewster Snow. "The Complete Highway" in *The Highway and the Landscape*, ed. W. Brewster Snow (New Brunswick, NJ, Rutgers University Press, 1959), 23.
[23] Eisenhower, Dwight D. *Mandate for Change 1953-1956 (*1963 memoirs)

[24] Eisenhower, Dwight D. Special message to the Congress regarding a national highway program from *The Age of Asphalts*, ed. Davies. 1975.
[25] The construction of the Interstate Highway System received little political opposition at the state or municipal level because the Federal Highway Act of 1956 paid for 90 percent of its costs. It was essentially free infrastructure money that created a job boom for a highly unionized construction workforce.
Even today, NYC subways and buses move 84% of the states transit riders but receive only 63% of state transit aid (from Transportation Alternative Organization, Oct. T.A. E-Bulletin).
[26] Lewis, Pierce. "The Landscape of Mobility" in *The National Road*, Raitz, Karl ed. (Baltimore : The Johns Hopkins University Press, 1996), 11.
[27] At the turn of the 20th Century, there were few cars on city roads and even fewer on country trails. The car was a privilege reserved for the wealthy. In New York, William Vanderbilt owned a $3000 Mercedes, which he drove down a nine-mile stretch of private highway that he had built at a cost of $6 million. The rural highway was a self-indulgent pleasure infrastructure. It would not be long however, before Henry Ford would revolutionize mechanical transportation and in the process, redefine the collective view of the American city and highway.
[28] Krieger, Alex. "The American City: Ideal and Mythic Aspects of a Reinvented Urbanism", (*Assemblage 3*, 1987), 38-59.
[29] Krieger, 40.
[30] Sartre, Jean-Paul, *American Cities*
[31] Kieran, Stephen and Timberlake, James. "Paradise Regained", *Architecture*. December, 1991, p.50.
[32] www.thetube.com/content/history/map
[33] Appleyard, D. et al. *The View from the Road* (Cambridge Massachusetts: M.I.T. Press,1964), 65,6.
[34] American Association of State Highway Transit Organization (AASHTO). *A Policy on Geometric Design of Highways and Streets: 1990* (Washington, D.C., 1990),120.
[35] Banham, Reyner. *Los Angeles: Four Ecologies* (New York: Peguin Books, 1971), p.90.
[36] Koolhaas, R. *Bigness* , *SMLXL*, ed. J. Sigler (New York: Monticelli Press, Inc., 1995), 1249.
[37] Wright, F.L. *The Living City* (New York: Horizon Press, 1938), 82.
[38] Jackson, 91.
[39] Jackson, 101.
[40] Schuyler, David. "Toward a Redefinition of Urban Form and Culture" in *The New Urban Landscape: The Redefinition of City Form in Nineteenth Century America*. (Baltimore: John Hopkins University Press, 1986), 28.
[41] Schuyler, 32.
[42] Wright, 79.
[43] Wright, 79.
[44] Wright, 85.
[45] Wright, 87.
[46] D. D. Eisenhower, *Mandate for Change 1953-1956* (1963 memoirs)
[47] Mumford Lewis. *The City in History* (New York: Harcourt, Brace and Schuster, 1961), 45.
[48] Vanderbilt, 115.
[49] Jackson, 249.
[50] Interstate City is centered on the transportation fantasies of the 1956 Interstate Highway Act and is carefully detailed in the Green Book, A Policy on Geometric Design of Highways and Streets (FHWA - Office of Program Administration,1956)
[51] Weingroff , 1.
[52] Belloc, Hillaire. *The Road*, (Manchester, England: Charles W. Hobson 1923)

[53] In 1921, the original White Castle hamburger stand in Wichita, Kansas introduced the era of fast food.
[54] Koolhaas, 505.
[55] Banham, Reyner. *Megastructure: Urban Futures of the Recent Past* (New York: Harper & Row Pub. Inc.,1976), 9.
[56] Coupland, Douglas. *Microserfs,* (New York: Harper Collins Publishers, 1995), 14.
[57] Maki, Fumihiko, *Investigations in Collective Form* (St. Louis: Washington University, 1964), 8.
[58] Ralph Wilcoxon definition of Megastructure from the *Council of Planning Librarians Exchange Bibliography* (Monticello, Illinois, 66, 1968), 2
[59] Donald P. Eisen, Executive Managing Director of Cushman & Wakefield, Realty Inc. in East Rutherford, New Jersey say that Parsippany, traditionally a strong economic area has developed recent soft spots. Companies simply pick up and move to the Interchange down the highway where rents are more affordable.
[60] Schlosser, 57.
[61] Vanderbilt, 115.
[62] Coupland, 134.
[63] Harris, Steven, Berke, Deborah. *Architecture of the Everyday* (New York: Princeton Architectural Press,1997), 3.
[64]http://www.fhwa.dot.gov/environment/vgmg_txt.htm
[65]Wallace, Henry. How to Make Good Dirt Roads, 1905
[66]National Humanities Center:
http://www.nhc.rtp.nc.us:8080/tserve/nattrans/ntuseland/essays/roadsb.htm
[67] Raitz, 211.
[68]http://dupont.com/corp/overview/glance/index.html
[69] http://www.nobel.se/nobel/alfred-nobel/biographical/life-work/index.html
[70] Weingroff, Richard F. "Dwight D. Eisenhower System of Interstate and Defense Highways: Engineering Marvels", *Public Roads Magazine*, Vol. 60, No. 1, Washington, D.C., 1996.
[71] Koolhaas, 1247.
[72] Weingroff, Richard F. *Dwight D. Eisenhower System of Interstate and Defense Highways: Engineering Marvels*, Public Roads Magazine, Vol. 60, No. 1, Washington, D.C., 1996.
[73]The U.S. has over 2,200,000 miles of paved roads.
http://inventors.about.com/library/inventors/blasphalt.htm
[74] The first recorded asphalt pavement in the United States was a sand mix placed in front of the City Hall in Newark, N.J., in 1870 by Edmund J. DeSmedt using natural asphalt.
[75]http://inventors.about.com/library/inventors/blasphalt.htm
[76] Asphalt Contractor Magazine, February 1999
[77]http://www.hotmix.org/view_article.php?ID=10
[78] The Caterpillar BG-2455C is a high-production machine weighing 40310lbs designed for Interstates highways, subdivisions, airports and other similar sized projects. It is suited to all geographic regions that favor track or rubber tired pavers like those with sandy and loose soils or areas with significant grades. The versatility of the BG-2455C allows it to work on a wide-width highway job one day and a confined parking lot the next. With the addition of the Extend-A-Mat 10-20B Screed, the paving width increases from 10' to 24'-2", the equivalent of two lanes.
[79]http://www.hotmix.org/view_article.php?ID=10
[80] AASHTO
[81]http://www.hotmix.org/view_article.php?ID=10
[82] Kieran, Stephen and Timberlake, James. "Paradise Regained", *Architecture*. December, 1991, p.50.
[83] Banham, p.213.

[84] Craig Knepper. (September 9, 2001) personal interview.
[85] Cars at constant highway speeds give much the same noise reading whether or not the engine is operating, because the noise is principally produced by the tire-roadway interaction with some added wind noise. (AASHTO, 41)
[86] J. Baudrillard
[87] Corner James. *Recovering Landscapes: Essays in Contemporary Landscape Architecture*, (New York: Princeton Architectural Press, 1999), 155.
[88] Corner, 71
[89] The potential uses of the simulator are endless. Ginger Watson of the Human Factors Laboratory ponders an MRI type brain scanner that gets mounted within the cockpit. It could monitor a driver's responses at the neurological level. Although this type of test may be years away, it illustrates two points: first, that the study of mobility in the automobile is reductive, it breaks down our actions to the minutia; second, it recognizes that there are cognitive functions that are innate within humans.
[90] Lynch, 4.
[91] Appleyard, 3.
[92] *Freon* is a registered product of the *Dupont* Corporation, the company that got its start as a munitions and dynamite manufacturer. Not only did Dupont contribute to the reduction of physical obstacles but helped isolate and control the weather inside the automobile.
[93] Federal Civil Defense Administration. *Four Wheels to Survival* (Washington, D.C.: GPO, 1955).
[94] Excerpt from A Policy on Geometric Design of Highways and Streets (1990), 51.
[95] Prior to the Interstates, it was common for cars to carry chains in the trunk to trudge through the snow. Chains however, are antiquated technologies in Interstate City; they take time to apply, reduce speeds and provide a bumpy ride.
[96] At a toll plaza at the Delaware Gap on the I-80, half a dozen children sell refreshments to idle (and captive) drivers as they wait to pay the mandatory $1.50 to cross the bridge.
[97] Hiaason, Carl. *Sick Puppy* (New York: Werner Books, Inc, 1999), 189.
[98] Lockwood, Charles. "What happens when the downtown freeway comes down" (Part 20: Friday, January 21, 2000), from Environmental News Network (enn.com). and Thomas, Katie. "Tunnel Vision Is Looking Dim: Predictions from the past that haven't come true ... yet", from http://future.newsday.com/8/fbak0813.htm
[99] While the highway may be reconsidering its greater context, the citizens of Interstate City (or more accurately put, automotive manufacturers) continue to inhabit the highway with enormous polluting vehicles. Automotive manufacturers openly admit to failings to live up to promises made only a few years to increase fuel efficiency. [Hakin, Danny. "Ford Motor Company backs Away", from the New York Times (4.17.2003)]. In the next breath, they announce the largest fleet of vehicles that consume the lion's share of the 270 million barrels of oil estimated that SUV consume *each day* in the United States.
[100] Eisenhower, Dwight. Speech to Congress, Feb. 22, 1955.
[101] Beyond the ditches are conspicuous mobile infrastructures. The *Larsen Company* out of Tucson, Arizona produces camouflaged antennae for the telecommunications industry. In 1992, the company supplanted their Theme Park building business by offering tree-like designs for transmitters appropriately shaped to the region's vegetation.
[102] http://www.nycroads.com/roads/I-80_NJ/
[103] http://metrocommute.com/mc/splash.html
[104] Ed Overton, SAS software designer, *personal interview.*
SAS (Statistical Analysis Software), in North Carolina, specializes in "data mining" software. Their programs allow companies to compile information from hundreds of groups, industries, markets, and surveys to find hidden patterns of consumer behavior.
[105] "In the United States, there is no comprehensive privacy law prohibiting data collected for one purpose from being sold and used for another."

Rosen, Jeffery. The Unwanted Gaze: The Destruction of Privacy in America (New York: Vintage Books, 2001), 165.
[106] Cadillac Deville DTS, *DHS. Product brochure*, 2001.
[107] http://www.parsippany.net/aboutto.html
[108] Harding, John T. *Morris County: Birthplace of the Future*, (Montgomery, Alabama: Community Communications, Inc., 2001), 48.
[109] Interstates with 3 numbers are used in urban areas. When the 1st digit is even, the Interstate goes through or around the city. When it is odd, the Interstate is a spur into the city.
[110]www.parsippany.net/aboutto.html
[111] History of Morris County, New Jersey with Illustrations, and Biographical Sketches of Prominent Citizens and Pioneers, 1739-1882; (New York: W.W. Munsell & CO., 1882)
[112] Ibid.
[113] Macasek, Joseph J. Guide to the Morris Canal in Morris County: A layman's guide to the elusive remains of one of New Jersey's s historic canals, (Morris County Heritage Commission, 1996), 50.
[114] Ibid.
[115] The Next EXIT: The Most Complete Interstate Guide, 10th Ed. (Garden City, Utah: Next EXIT, Inc. 2001)
[116] http://www.pressroom.ups.com/about/history/0,1701,,00.html
[117] http:www.pfizer.com
[118] http:www.rochevitamins.com

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